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CONTENTS

An Asterisk (*) denotes an illustrated article.

EDITORIALS —

Briefly Told 761

The Lease of the Philadelphia Gas Works—Competition in the Artificial Lighting Business in New York—Mr. Searle's Paper on "Gas Advertising."

Twenty-fifth Annual Meeting, American Gas Light Association—Abstract of Proceedings—Continued from page 732..... 762

Second Day, Morning Session—Telegram from President-elect Crockett—Rust Deposits in House Pipes, by Mr. F. B. Wheeler—Discussion—*Purifiers, by Mr. W. R. Beal—Discussion—Report of Committee on Next Place of Meeting—Report of the Committee on Research—Report of Committee on President's Address—Chemical Notes, by Mr Henry A. Mather—Discussion—Second Day, Afternoon Session—Gas Advertising, by Mr. R. M. Searle—Discussion.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 772

Extending Its Electric Service, Hackensack (N.J.) Company—Gas Franchise, Irvington, N. J.—Cheaper Gas for Freehold, N. J.—Resolutions to Memory of Mr. H. D. McCaffrey—Directors Elected, Marion, Ohio—Death of Mr. Morgan W. Brown—Receiver for the Medina (N. Y.) Company—Appraisal of the LeRoy (N. Y.) Works—New Mains and Services, Batavia, N.Y.—Annual Meeting, Sherbrooke (Can.) Company—National Electric Company, Stamford, Conn.—Mr. Nutter Changes His Residence—Painting Gasholders by Compressed Air—Contract for the Berlin Iron Bridge Company—Minneapolis (Minn.) Company Wins in Court—Gasoline "Jags"—Something about the Gas Supply of West Saginaw, Mich.—And Other Items.

The Market for Gas Securities..... 774

BRIEFLY TOLD.

THE LEASE OF THE PHILADELPHIA GAS WORKS.—Dreamers, like Mr. Bellamy, and theorists, like Professor Bemis, as well as "practicalists" resembling Mr. Cross, have contended and are contending that all business functions, which in any sense require for the basis of their operation a grant that inheres, no matter to what minute degree, in the "corporate rights" of the people, should be conducted by the people. On the other hand, some of the people who have means of their own at command, contend that out of their plethora they can serve the balance of the people much better than the latter may serve themselves through the disposition of funds accumulated by taxation imposed, as far as possible, upon all of the people. Whether the dreamers, theorists or "practicalists" are right, or whether the capitalists (on private account) are wrong, is a problem that has confronted the human life of the world since the first page of its history was written; and the ordinary observer and student have but one honest recourse—to admit that the problem still remains unsolved. Those interested in the gas business necessarily admit that they are in a measure dependent upon the public favor for their very existence as commercial factors, in that in order to live they must have from the lawmaking authority permission to disturb the public highways. It is true that of all commercial undertakings asking rights from the authorities, those engaged in the gas business plead for less than the ones interested in other divisions of quasi-public trade. The only right that a gas company really receives from the public is to open the public highways, "openings" that are usually hedged with so many restrictions, as to restoring surfaces, etc., of streets, that the public in no sense suffers from the work so done. In this view proprietors of gas companies have no particular reason to thank the supreme power of the people which gives the companies life; for the people would speedily say to the gas men, in case some other illuminating agent was developed that was cheaper (values considered in every respect), when you expended your money in burying mains we guaranteed you only our permission to use the streets. We did not agree to buy your product. That aspect of the public franchise case might easily be argued at far greater length; but this introduction, prolix and verbose as it is, together with what follows, will be quite sufficient to show that when such things as the manufacture and distribution of gas are committed entirely to the care of the tax levying people, the latter are not competent to manage them—the dreamers, the theorists and the practicalists to the contrary notwithstanding. It has be enknown for years that many gas undertakings were conducted in America on public account; and it has also been known in the trade that the undertakings so conducted were scandalously marked by inefficient management. Such undertakings were on the large and small scale, and the medium as well; the sendout on maximum account (Philadelphia) being, roughly, 5,000 million cubic feet per year, the minimum, possibly shown at Alexandria, Va., where the annual sendout is less than six millions cubic feet; with the medium example at Richmond, Va., the annual sendout from which plant may be put at 240 millions cubic feet. Nor have these separate undertakings the right to be considered experiments, since each of them has been in operation for well over two score years. What has that length of operation shown? A gradual

decline all round, and in every instance; a verdict that must not be taken as meaning that the output has not increased nor that the value of the plants to the people whom they serve has not augmented. What is meant is that not a single plant under municipal control, from its creation, has kept fairly even pace with plants put in service by private enterprise at other points, either in respect of the value of its service to the residents, or in the shape of profits in money to those who owned it. Such is the real truth in respect of the experience in this country as between municipal control of gas works and the control of such works by ordinary, everyday capitalists. In this light no particular surprise is occasioned by the recent action of the Philadelphia City Councils in accepting a bid from certain capitalists, who stated the terms on which they would be willing to lease the city gas plant for a specified period of 30 years. The resolution, or ordinance, or franchise, or whatever the appropriate term for it may be, is now before Mayor Warwick, for his approval or dissent. Certain legal proceedings are in process to restrain the Mayor from accepting the action of Councils; but no matter what the final result of the dilatory proceedings may be, and apart from any discussion here whether the bid of the so far successful competing company was the best one for the interests of the city of Philadelphia, the fact remains that the authorities of Philadelphia, so far as its law making branches are concerned, have decided that its gas supply would be better under the dominion of private control than if retained under public direction. And we submit that the history of the Philadelphia municipal gas plant bears out that determination.

Competition in the Artificial Lighting Business in New York City.—The air is moving with rumors that a lively contest over the artificial lighting business of New York is at hand—in fact, that the war is on. The contending forces are the local gas companies and the local electric lighting companies, and the aggressors just now are the latter. Largely depending on the "greater luxuriousness" of the article which they had to supply, the electricians relied so much on that factor that they overlooked the very common factors of cheapness and efficiency, which twins can be safely and at all times counted on to outgrow the child of mere luxury. The real fact of the matter is that the ordinary consumer or user of light in a large city knows in the long run that which serves his purpose best, and the ordinary light user in New York seems to have determined to stick to gas. The Welsbach, or other description of incandescent gas burner, has been the agent which caused the local electric companies to estimate why it was that their gross and net increase in business was fairly good "on Broadway" and on other prominent ways, while the reverse was the case in the "gross and net" from less publicly frequented parts. And the same burner agent is likely to make greater trouble for the electricians in New York than it has hitherto made. The estimate of the electricians was sufficiently comprehensive to show them that something must be done not only to improve their position, but to recoup their losses; so it was determined to make a "sensible cut" in charges. The new rates have been made public, and the cut amounts to a "horizontal slash" of about 20 per cent. over the electric terms heretofore prevailing. Meanwhile, to add to the discomfort of the local electric companies, the charges for incandescent gas burners and the necessary fixtures have been so greatly reduced, through the exigencies of trade, that the Edison, Westinghouse and other electrical servers in New York will shortly have to establish a further amended schedule so they may even keep the luxurious patronage they now enjoy.

Mr. Searle's Paper on "Gas Advertising."—In our current chapters of the proceedings of the last meeting of the American Gas Light Association will be found the text of a paper on "Gas Advertising," by Mr. R. M. Searle, now of Atlanta, Ga., but whose knowledge of the matters of which he wrote was largely gained when he had direction of the affairs of the Johnstown and Gloversville (N. Y.) Gas Company. The fact that his Company sent him to a larger field at Atlanta, Ga., than the one formerly tilled by him in New York, goes to show that he knows his business, and that his employers know it too. However, the plan which caused his success as a "Gas Advertiser" in Johnstown may be reasonably counted on to bring further chapters of like results in Atlanta, for if one does well in a small place he should do better in a larger one. Our regret over Mr. Searle's paper and its discussion is that, according to the rule of the Association, we are debarred from reporting in full all that was said after the paper was read. We did not attempt to abstract his replies to those who questioned him during the debate, for long-hand reporting cannot reflect in any sense justice to the words of a terse and crisp speaker. Perhaps next year the Association will expand its views to the point of believing that those who are not present at its meetings are entitled, as general members of the gas making craft, in a measure to share, as speedily as may be, the benefits that arise from such assemblages. It should be remembered that not all can spare either the time or money which membership in the Association and attendance at its meetings entail.

[Abstract of Proceedings.—Continued from Page 732.]

TWENTY-FIFTH ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

Held in Hotel Chamberlin, Fort Monroe, Va., October 20, 21 and 22, 1897.

Second Day—Morning Session—October 21.

The Association reconvened at 9:30 A.M., the sessions of the second day being opened by the reading of a

Telegram from President-Elect Crockett,

acknowledging the honor conferred upon him, and assuring the Association that his earnest desire was to in every way advance its interests.

The President then introduced Mr. F. B. Wheeler, of Long Branch, N. J., who read the following paper on

RUST DEPOSITS IN HOUSE PIPES.

Every superintendent of a gas company has heard the complaint, "The pressure is poor at our house." Investigation of the trouble has frequently proved the cause to be due to accumulations of rust in the house pipes, the obstructive matter being variously distributed through the pipes, the riser ell, and the leader pipe from meter to riser.

The superintendent, in cleaning out the rusty matters from the house piping, has often been astonished at the great quantities of rust blown out, several cigar boxes full sometimes being brought in by the foreman as a proof of the thoroughness with which he has done the job. The superintendent has sometimes exclaimed: "Where did all this come from? Are any of the original pipes left? Have they all gone to rust?" Patrick has replied: "The pipes all seem *rale* good, sir."

It is now proposed to investigate,

First. What does this rust consist of?

Second. Where did it come from?

The interior of gas pipes may be corroded by rusting in four different ways:

1. In scattered patches.
2. In a pimply or "goose flesh" way.
3. In longitudinal grooves.
4. So uniformly all over that nothing unusual in the inside appearance of the pipes can be seen.

In order to rid the question at the start of several doubtful points, the fourth way has been chosen for a careful analysis.

A large hotel built in the sixties was thoroughly overhauled under my supervision this spring. Deposits of rusty matter were found quite uniformly all through the pipes, but in the leaders from three meters, the deposits were enormous in amount. The pipes showed no internal corrosion to speak of, appeared smooth, and in many cases, black inside. About 12 pounds of this rust was carefully collected. 8.68 pounds were devoted to the general series of experiments, the balance for special tests. The former was mixed together, and quartered down to a small amount, so that the mechanical result was a fair sample of the whole.

Inspection showed the presence of:

a. Iron rust.
b. Naphthaline scales.
c. Oxidized white lead in scales.
d. Spongy lumps.
e. Grit, etc.
f. Scales taking shape of pipe.

The "scales taking shape of pipe" were mostly dislodged by hammering, to free all the particles. These scales were black and resembled the oxide scales from new pipe, or freshly heated iron, cooled in air at the anvil, but were a dead black, as though acted on by moisture to some extent. The whole smelled very "gassy," was dry and dusty. Several crucibles were weighed, filled with the samples, weighed again, and heated in a Bunsen flame to a bright red heat for one hour each. The crucibles were then cooled and weighed again. The loss represents the weight of the contained hygroscopic moisture and the volatile matters of the hydrocarbons contained as naphthaline and dried, spongy, tarry, lumps, sulphur, etc. The average of ten crucibles showed an average loss of 29.8 per cent. volatile constituents. The smallest loss was 28.6 per cent. The largest loss was 31.7 per cent., showing not very wide deviation from the average. The residue obviously contained iron as sesquioxide, grit, oxide of lead, etc. Samples dried in an oven for several hours each showed an average loss of weight at a temperature of 180° F. of only 2.14 per cent.

Digestion in cold absolute alcohol and careful filtration and weighing showed a loss of 2.17 per cent., due to absorption of the naphthalines.

The determination of the amount of sesquioxide of iron present with the sulphur and hydrocarbon compounds was found to be rather a difficult task obviously. Most of the methods laid down in the text books for the determination of the amount of sesquioxide of iron contained in various ores are not properly applicable to this determination on account of the numerous sources of error that creep in, and especially to the difficulty in preventing some of the iron from oxidizing away in reducing the ferric solutions to ferrous ones for quantitative work.

The methods have to be performed under a current of CO gas, have to be cooled rapidly, air-free water must be used in all the operations, so that after numerous trials of different methods, the rule of Fresenius was adopted, the precipitation of the iron as a hydrated sesquioxide.

The weighed samples were digested in warm hydrochloric acid for a considerable time, the whole contents of the beakers were transferred to porcelain evaporating dishes and mixed with an excess of strong ammonia. The solution was then raised to the boiling point, decanted repeatedly into a filter, washed profusely with hot water, and dried very thoroughly at 212° F. The filter with precipitate was then kept 48 hours in a desiccator until it showed a constant weight. The filter and precipitate were then carefully ignited at a bright red heat for an hour. The crucible, after cooling in the desiccator, was weighed, reignited, cooled again, and weighed for a constant weight. The average of three determinations in this way, after deducting the filter ash, was 69.7 per cent. This residue consisted of anhydrous sesquioxide of iron with a small amount of siliceous matter that was found after resolution and filtration to be 0.4 per cent., leaving as sesquioxide 69.3 per cent.

To determine the sulphur trioxide, a solution of hydrochloric acid with the rust was boiled, filtered, bromine was added, the solution was boiled again, an excess of normal solution of barium chloride was added and the whole boiled again for 10 minutes. After thorough stirring, the solution was filtered and the filter washed with hot water until alkaline. The precipitate was dried, weighed, ignited and weighed again as barium sulphate. The amount of this sulphate multiplied by its combining number 0.343 gives the sulphur trioxide. The amount present was found to be 3.51 per cent. The first precipitate from the hydrochloric acid solution was dried at 212° F. The temperature being raised to 220° F., sulphur fumes were given off, showing the presence of sulphur either as a residue of SO_3, as CS_2, or possibly some free sulphur. These fumes crystallized on a cold watch glass in minute needles. This first precipitate was then digested with bisulphide of carbon in the same manner as in determining the sulphur in used sponge. As a result, an additional 1.23 per cent. of sulphur was extracted. The balance of the components of the samples amounting to 21.25 per cent. was of course consumable carbonaceous matter with a trace of lead as an oxide. The average loss of combustible and volatile constituents from 10 combustion experiments has already been shown to be equal to 29.8 per cent. of the whole. From the general analysis the same matters are shown to be equal to 30.3 per cent.

The difference between the two sets fairly represents the error of the experiments to be 0.50 per cent.; hence the composition of this particular batch of rust deposits is made up as follows:

Oxide lead	trace
Moisture	2.14
Siliceous matters	0.40
Sulpur trioxide	3.51
Sulphur compounds	1.23
Naphthaline	2.17
Sesquioxide iron	69.30
Carbon	20.75
Errors of experiment	.50
	100.00

Three things in this analytical scheme will at once catch the attention.

a. The small amount of naphthaline.

b. The presence of sulphur compounds in quantity.

c. The large amount of carbonaceous matters.

As to the first, it is all there was. The sulphur was undoubtedly due to 20 years' use of coal gas with lime purification. The carbon will receive attention later on.

It must not be assumed that all rust in all house pipes everywhere is composed like the above, for it is not; not even in the same building. The smallest amount of sesquioxide found in any one sample was 24 per cent.; the largest was 79 per cent. The quantity of iron contained in the rust of the leaders and risers is greater than that in the rest of the same building usually. The quantity of naphthaline varies enormously. In this particular building under test, the naphthaline in the small house pipes on top floors was at least five times that in the leaders, being in one case 11 per cent. of the sample. The moisture varies very markedly, also the carbon content, which last was greater in the leaders, keeping step apparently with the iron. Nevertheless, on account of the large quantity of rust sampled, and the numerous experiments and partial experiments made, it is believed that the analysis represents fairly well a large average of finds.

We have now investigated the question: What does this rust consist of? Let us now turn our attention to the second question: Where did it come from? This inquiry can be pursued in the same building as before.

A 1½-inch leader pipe from one meter in this hotel had certainly, from the way in which it had been built, never been disturbed or blown out since the erection of the building. This pipe was a single length, 18 feet long, with a slight trap in it, but no water. The contents were dry and dusty. The pipe was lifted down and the contents preserved. It contained 8.68 pounds of rust. One foot of this pipe was carefully cut off and filled full of the rust. The contents of this foot weighed 13.23 ounces. Since 18 feet contained 138.9 ounces, the pipe as found was 58.3 per cent. of being actually full of rust, or a little more than half full. The empty length weighed 43.38 pounds, or 2.41 pounds per foot. A standard new black iron pipe weighs by card 2.68 pounds per foot. The present pipe standard was adopted in 1872 at the instance of Morris, Tasker & Co., who were then the only mill of any size making pipe here. This firm was the only manufacturer of pipe in this country previous to 1870. They always had this weight as their standard. This hotel was erected by Philadelphia parties, so that it is almost certain that Morris & Tasker made this pipe. A comparison of internal and external measurements of this length, with full-weight new pipe, show a very close agreement. It can be assumed closely, then, that the length of pipe in question weighed, when new, 2.68 pounds per foot. Consequently the loss of weight was 0.27 pound per foot. This loss was, from careful examination, judged to be equally divided between the external and the internal loss by corrosion. Then 0.135 pound per foot was the amount of pure metal lost by internal corrosion, or a total of 2.43 pounds. This corrosive loss occurred in the usual way. The oxygen of the air and moisture, when no meter was set, also the CO_2 present in the gas with the moisture of condensation, uniting to bring this about.

As 69.3 per cent. of the rust deposits were found in analysis to be iron rust, $8.68 \times 69.3 = 6.015$ pounds of iron rust were in the contents of the pipe, or 4.21 pounds pure metallic iron, since the combining equivalent is 0.70. The difference between the assumed loss of weight and this quantity leaves 1.78 pounds pure metallic iron, which was carried into that pipe and deposited there as rust from some point on the works side of the meter. Where did all this iron come from? How did it get there? Was it mechanically transported there in the gas as fine particles of iron sponge? I think not. The works had only used sponge two years, using lime before. Nor is there erosive force enough in the gas to take up mechanically particles of iron or rust from the inside of the mains to any such extent. It is my belief that it came from the presence of carbonyl of iron in the gas in minute quantities.

Berthelot states that carbonyl of iron—a volatile substance—is condensible to a liquid at 32° F., a common enough temperature. This fact determined me to attempt to synthesize the liquid carbonyl by passing a quantity of illuminating gas—carbureted water gas—through glass tubes inclosed in a freezing mixture, in amount sufficient to form a weighable quantity.

A coil of ½-inch glass tubing of 10 turns was imbedded in a freezing mixture in such a way that the gas from the meter passed through the coil on its way to the burner, which consumed about 4 feet per hour. The temperature was kept at 0° F. During four days and nights, or 96 hours, gas was passed through this condenser until 400 feet were registered. Some little trouble was experienced the latter part of the time from condensation, so the burner was abandoned as unnecessary. This condensation in the coil was carefully saved. The tube was shaken full of hydrochloric acid, then washed out with the same and hydric nitrate, HNO_3. The original condensation was put with these washings, neutralized with ammonia and tested for iron with a solution of potassium ferrocyanide. The test gave the Prussian blue of iron content at once. Upon reducing the solution and titrating with ammonium sulphide, 0.436 gram of iron was found for 1,000 cubic feet of gas. This

gas was regular carbureted water gas with the analysis at time of experiment of—

Illuminants–	14.00
CH_4–	19.80
H–	32.00
CO–	27.40
N–	3.65
O–	0.45
CO_2–	2.70
	100.00

The purification was by iron sponge, home made, in use some time.

Since making the above experiment it has been brought to my notice that Sir Henry Roscoe, in November, 1892, published an article in which he stated he had made this experiment, using ice around the condenser, temperature about 32°.

I have repeated his experiment with 200 feet of gas, and making the proper calculations, in titration, 0.417 gram was deposited per 1,000 cubic feet of gas of practically identical composition.

There may not have been as much iron in this gas, the reason of less iron may have been a manipulative one, or may have been due to the lesser degree of cold for condensation, about 30° above the other experiment. These experiments, together with Sir Henry Roscoe's, conclusively prove that metallic iron carried in illuminating gas as carbonyl may be deposited in the mains or house pipes, provided the latter are cold enough and all other conditions suitable.

In the experiment at 32° 0.417 gram was thrown down per 1,000 feet. As 1 gram = 0.0353 ounce, it would require 1,087,000 feet to deposit 1 pound of iron — the whole to pass through at a point about freezing.

In the 18-foot length under consideration 1.78 pounds were carried in as a deposit, during about 30 years, requiring probably 1,934,800 feet of gas loaded with 0.417 gram of carbonyl. Many of the winters no gas was used, the balance of the period this pipe fed gas to a family. Certainly 3,000,000 feet of coal and water gas passed the meter within that time.

It can readily be assumed, then, that in our ordinary temperatures met with here, from 20° below to 32° above 0° F., carbonyl of iron, if present in gas, will deposit more or less, and oxidize into rust in all house pipes. The coolest part of a house is the cellar usually; and it is in the cellar piping, the leader pipes from the meters, and at the bottom of riser ells, that we find the largest accumulations of rust. Our analyses have shown that more iron and carbon are found in the cellars than anywhere else, with less naphthaline. This is explainable probably in this way: The cold deposits there the carbonyl of iron more readily, also the naphthaline; but with warmer weather or hotter gas, the naphthaline is carried farther along to the burner and consumed, or again deposited in the upper stories, as, indeed, we have found it in the case at hand.

Can these deposits be prevented? If the gaseous carbonyl be kept down to the lowest point in the illuminating gas by the use of proper purifying material, there will evidently be less to be deposited. If the temperatures of buildings and cellars are kept above the critical point of deposition, there will undoubtedly be less trouble from this source, although I believe it possible for the carbonyl of iron to be thrown down at temperatures considerably above the point of liquefaction in the following manner, analogous to the action of nuclei in a freezing liquid. Some liquids may be kept so at temperatures several degrees below their critical freezing points, but if a small particle of solid matter be dropped in, freezing starts at once, with this particle as a nucleus, and rapidly permeates the whole. So with carbonyl of iron in a gaseous condition at temperatures above the critical point of its liquefaction, if particles of naphthaline or aqueous vapor be thrown down in the gas, they may act as nuclei to drag out particles of carbonyl of iron in unstable equilibrium, from the gaseous to the liquid state. These may be dropped in a finely divided mist with the naphthaline; that, later, under a change of temperature, is picked up again by passing gas and carried on farther, leaving the probably now oxidized carbonyl as the regular and familiar sesquioxide of iron, or red rust, some free carbon and moisture. It is my belief that naphthaline and condensed aqueous vapor deposits are the primary causes of much of these rust deposits from this hypothetical and mutual interaction.

If the literature upon the subject of carbonyl be examined, it will be found that carbonyl of iron is indeed a volatile substance. It is a crystallized solid a degree below 0° F., a liquid at 32°, and a gas at temperatures above and readily distills over at 212° F. There is indeed a striking analogy between this substance and many other carbon compounds such as:

Benzol, solid at 32° F., boiling at 177°.

Bisulphide of carbon, solid at 10° F., boiling at 116°.

Several ether compounds; and singularly enough, water.

The well known phenomenon of the condensation of water from the gas passing through our mains is now a point to which I wish especially to call attention, as bearing vitally upon this question. It has, of course, been known that this condensation depends upon a fall of temperature below that of the distributing holder, together with the tension of aqueous vapor carried. If the flowing gas, at a certain temperature and aqueous vapor tension, drops in temperature before reaching its destination, there must inevitably be a deposit of moisture somewhere on the line.

In this regard I wish especially to refer to the paper by Mr. W. E. McKay, of Boston, read at the Twenty-seventh Annual Meeting of the New England Association, February 17, 1897: subject, "Temperature." The average, August, 1897, ground temperature of the gas issuing from the street main at inlet of station meter at one of our stations here, the gas having been pumped 7 miles, was 74° F. The average temperature for the first 10 days in August of the dark, cool cellar of the hotel whose pipes are the subject of this investigation was 63°. The gas probably fell then from 8° to 11° upon entering this building. The average minimum temperature of the outside air in August was 65°. The average maximum temperature was 82°, both on our recording thermometer. This cellar temperature is then readily explained. From Mr. McKay's table for water gas, *saturated* with aqueous vapor, a drop from 74° to 63° would represent the deposition of 0.42 pound of water per 1,000 cubic feet gas. The season of 1896, 101,200 feet of gas far from saturation passed this meter, leaving in the drip about 3 quarts of water. This water was not measured exactly, only estimated, but the facts are brought together here to illustrate the point I wish to make, which is, that aside from the deposition of any naphthaline particles, there was a *continual* deposition of condensed aqueous vapor in the pipes, of course in the form of a fine mist. Now four-fifths of all the gas passing through the meter on this leader pipe went through in the three summer months, hence to account for the total amount of extra metallic iron carried in during 30 years, there must have been during the summer season, also, a deposit of carbonyl of iron, which was carried down by the condensing aqueous vapor, as well as by any naphthaline. Naphthaline has always been a bugbear and an erratic thing. I believe that the extremely volatile carbonyl of iron also is a thing of vagaries; with its solid state at —1° F., liquid at 32° F., and gas the balance of the time, but decomposing at 550° F.

We have found in this investigation that rust deposits in house pipes contain about 69.3 per cent. of rust, Fe_2O_3, or 48.5 per cent. pure metallic iron, a considerable quantity of which is carried into the pipes by the gas itself, due to the presence therein in an unstable condition of carbonyl of iron. This action can be readily produced experimentally by use of freezing mixtures. The action takes place in cold weather, also upon drops of temperature, and is hypothetically helped by the presence of particles of naphthaline and *aqueous vapor*, also probably to some extent by friction in the small house pipes. The amount deposited can be decreased by the use of good purifying material, by keeping the inside of houses warm in winter, by preventing the formation of naphthaline, by sending out dry gas, and by keeping down the amount of the usefut diluent CO. Average samples of coal gas contain about 14 per cent. of CO, and carbureted water gas has about 27 per cent.

In the sample case here discussed, water gas had been in use 10 years, and iron sponge purification two years only. During the 30 years that this deposit was growing, the probable 14 per cent. CO in the coal gas, and, later, the 27 per cent. CO in the water gas, had been slowly doing the work of picking up the iron from mains and service and dropping some of it as carbonyl of iron, under the proper conditions of instability, in this leader pipe, taking up no iron from the purifying material, which was lime only. How much of this rust was thrown down during the two years' use of iron sponge imperfectly oxidized, it is impossible to conjecture.

It can logically be asked: Why do not our street mains and service pipes clog up with these deposits, if formed as has been assumed? They do clog up in time, under the suitable conditions. I have taken up thousands of feet of service and hundreds of feet of 3-inch and 4-inch main in Schenectady, for instance, which were more or less filled with these deposits. In that latitude, the temperature runs down to 20 odd degrees below zero for a few days every winter, often freezing all around the main, so that the ground temperature is lowered to a point low enough for precipitation. Schenectady is a coal gas town with lime purification of 30 years' standing. Coal gas, lime purified, with only about 14 per cent. CO does not have as great carrying power,

of course, for carbonyl of iron as water gas, but that it gets in its final work in time there can be no doubt. The long familiar "dead end main" troubles with burner stoppages, so well known to every old coal gas main, need only be cited in this regard to distinctly prove the presence there of the iron.

Let us now attempt to explain the amount of carbonaceous matter found in the analysis. This amount was 20.75 per cent., or $8.68 \times 20.75 = 1.866$ pounds carbon. A small part was undoubtedly due to the presence of a small quantity of drip oil from condensation dried away, and insoluble in absolute alcohol, but the major part was undoubtedly due to the decomposition of the carbonyl.

The molecule of carbonyl of iron is $Fe(CO)_5$. Its weight is then 196 made up of $Fe = 56$, $(CO)_5 = 140$. Consequently the amount of iron contained is 28.5 per cent., and CO 71.5 per cent. Then for every pound of metallic iron deposited, 2.5 pounds of CO are set free. We found a surplus of iron amounting to 1.78 pounds in the pipe; then $1.78 \times 2.5 = 4.45$ represents closely the amount of CO set free. The greater portion then undoubtedly passed over into the gas as CO, the balance was left as a deposit of carbon in the pipe.

It is always a most interesting thing to meet with the varied experiences of other members of our fraternity, so it is with great interest that I turn to the proceedings of the fifth annual meeting of the Pacific Coast Gas Association, published in the September 13th number of American Gas Light Journal. The matter referred to is the Question Box and the discussion. From this it will be seen that the familiar phenomena of rust deposits are well known in all their varied forms on the Pacific Slope; that their 3 inch mains choke up there too; that service pipes are not stopped as often as house pipes, which last are very often found full of granulated rust, and that in New York city, long before oxide purification was known, "*granulated rust the size of gunpowder in many cases had partially filled the pipes where they were in active service right along, but very seldom where the pipes were out of use.*"

The consensus of opinion of the speakers seemed to be that these granulated rust deposits were more often found when the gas was on and in use right along; that this granulated rust is not found in service pipes as often as in house pipes, and that the inside of the house pipes did not seem to be affected at all when the gas was on all the time, although the pipes were partially filled with these deposits. The gas manufactured by the speakers was mainly coal gas. All of these opinions bear out the conclusions of this paper.

Discussion.

The President said that the paper was before the Association for discussion, and called upon Mr. Ramsdell to open the debate.

Mr. Ramsdell thought some of Mr. Wheeler's conclusions were surprising, notably the trifling quantity of naphthaline discovered in the examination; also, the small damage that seemed to have occurred to the pipes from which the rust deposits had been taken. Considering the location of Long Branch, which was right on the ocean coast, the salty atmosphere of the place should, it seemed to him, have exerted a much greater oxidizing effect on the pipe than had been reported in the paper. He took it for granted that it was an ordinary plumbing job, and that the pipe was uncoated.

Mr. Neal asked Mr. Wheeler how the pipes were cleaned in the large building, which must have carried great lengths of pipe, much of which must have been of small diameter.

Mr. Wheeler replied that the pipes had to be cut in every floor of the building. Much of the deposits of course were found in elbows.

Mr. Littlehales asked if the particular building had been untenanted for some time, for it was his experience that such deposits accumulated quicker in untenanted than in tenanted buildings, which was quite opposite to the experience narrated by Mr. Wheeler.

Mr. Wheeler replied that the building (which was used as a hotel for summer visitors) was unoccupied 8 months in the year.

Mr. C. H. Page thought that corrosion of house pipes was in good measure due to ammonia left in the gas, because of imperfect scrubbing. He instanced a case of a 4-inch pipe that was giving imperfect service. It had been in use 25 years; in clearing it, the deposit removed was equal to 50 per cent. of the gas way of the pipe.

Mr. Wheeler in reply to questions, said he had never used a Springfield gas machine, nor had he had any experience with lead or composition house pipe. He had, however, in Schenectady, N.Y., removed composition pipes from the streets, in which accumulations of rust had been found.

Mr. A. E. Forstall said Mr. Wheeler acknowledged corrosion on atmospheric account in pipe that was open, and he further showed that some of the pipe had lost .27 pound per foot in weight from the corrosive action, although when the cleaned pipe and the deposits taken from it were both reweighed it was shown that the pipe plus the deposits was heavier than it was first put down. Under the circumstances Mr. Forstall thought the added weight at least came partly from carbonyl.

Mr. Wheeler then described in detail (in reply to a question forwarded him by mail by a member), how to determine the amount of iron carbonyl that was contained in finished gas. His description of the apparatus was concluded by the statement that its cost need not exceed $20.

On motion of Mr. Doty a vote of thanks was passed to Mr. Wheeler.

The President then introduced Mr. W. R. Beal, of New York, who read, in the shape of a "Short Topic" for discussion, the following paper, entitled,

PURIFIERS.

We have recently put in two purifiers[1], built after our own plans, which it may be interesting to refer to. The purifiers are 7 feet deep, 30 feet long and 24 feet wide. They were built in an old house 34 feet wide inside, which, if it seems desirable, may be extended for other boxes. When so extended boxes of greater depth will be put in.

The inlets (20-inch) are opposite each other, and the outlets are also opposite each other between the two boxes, having centers midway as to the depth of the boxes, the connecting pipes being fixed alongside the boxes on substantially the same plane, thus leaving all the space underneath entirely free of obstruction.

The flow of gas is directed by means of 4-way valves having many improved parts, which, we are confident, will make them work perfectly. Two layers of material are used in each box, the gas introduced between then, passing up through one and down through the other, and thence to the outlet pipe by a cast iron passage secured to the box and extending from the top of upper layer of oxide to and through the bottom layer.

In this passage are simple dampers to direct the flow of the gas through the different masses of oxide, to insure the equal fouling of both, if found necessary.

Two self-sealing outlets are fixed in the bottom of each box, for convenience in emptying the oxide. Over these outlets, inside of the box, are cages which may be lifted out to enable the convenient shoveling of the oxide to the dumping outlets.

The 4-way valves are easily worked by one man. All faces are covered while in use, and are thus protected from the action of the gas. All faces are also oiled through passages connected with a reservoir. The moving parts of the valves are supported on ball bearings. Provision has been made for raising the valve from its seat, when necessary or desirable. Valves of this type have been used in this country and found to be unreliable. We are confident, however, that our improvements will prove to be valuable in practice and lead to their adoption.

The oxide will be raised by machinery from the basement to overhead bins, and thence distributed in the boxes by an adjustable chute.

The advantages of the system are: Every desirable combination of boxes may be used; lessened cost of building on account of reduced ground space required; lessened cost of covers, proportionate to depth of boxes; lessened cost of boxes, increased capacity being obtained by slightly greater cost of side plates; lessened cost of connecting pipes; and lessened cost of valve system; greater efficiency, on account of lessened speed of flow, being in the boxes described 50 per cent. of that in boxes of ordinary type occupying the same ground area; lessened pressure, due to increased surface and lessened friction in pipes and castings.

The boxes described were recently constructed for our Company under the immediate supervision of Mr. T. R. Beal, our Superintendent, to whom is due the credit for improvements to the 4-way valve. He is present and will be glad to show blue prints of the system.

[The illustrations (see pp. 766 and 767) here given are reproductions of the diagrams submitted by Mr. Beal.]

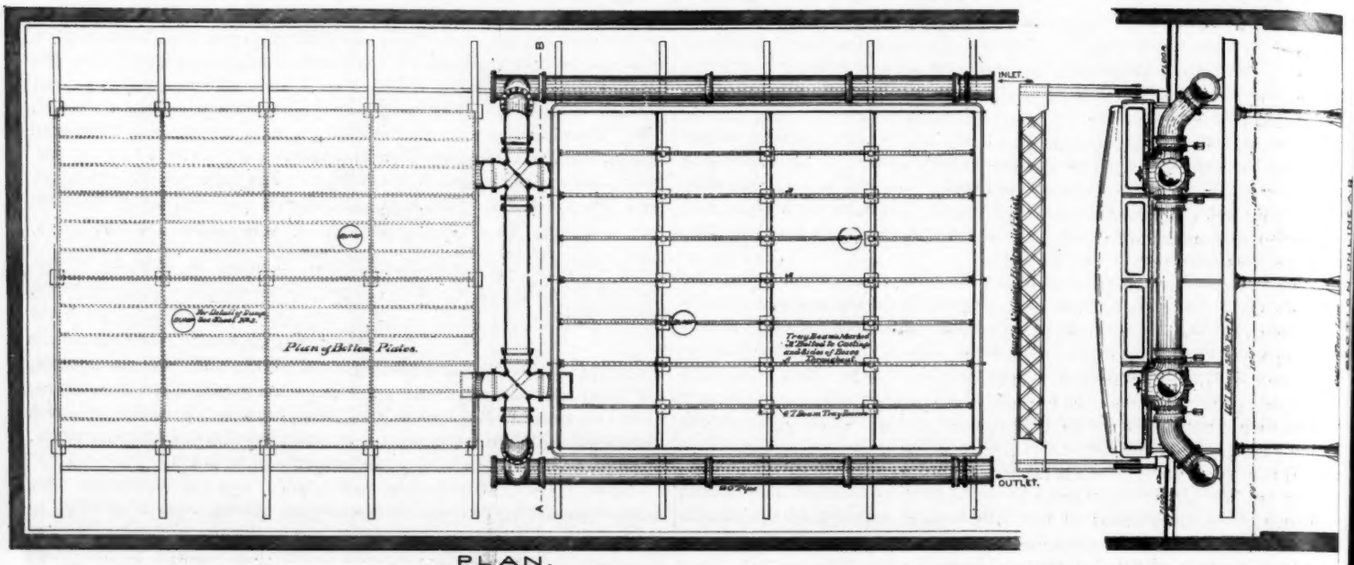
Discussion.

The President invited discussion on Mr. Beal's paper.

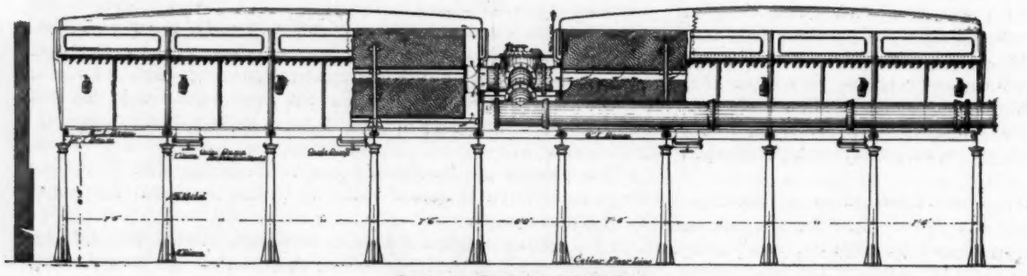
Mr. Littlehales asked Mr. Beal to define somewhat clearer the difference in his system and the ordinary plan, save in the item of greater depth.

Mr. Beal—As the inlets and outlets are along the sides of the boxes, the entering gas is discharged between two layers. An advantage of this method is that the pipes, being under the passages and not under the boxes, are out of the way. Boxes of this kind can be made of any

1. At the works of the Central Union Gas Gas Company, New York City.



PLAN.



PART ELEVATION AND SECTION.

TWO 24" × 30" × 7" DEEP

PURIFIER BOXES

WITH

IMPROVED FOUR-WAY VALVES.

ERECTED AT THE

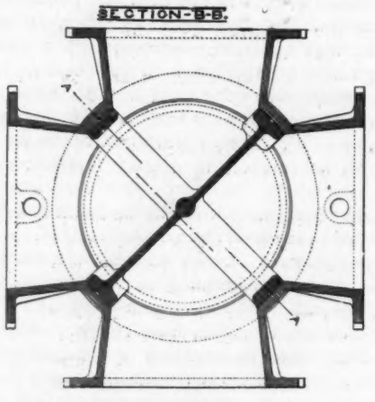
CENTRAL UNION GAS CO'S. WORKS

NEW YORK CITY.

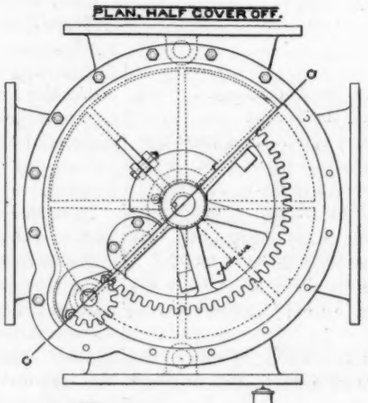
1897

T. A. Boal
Supt.

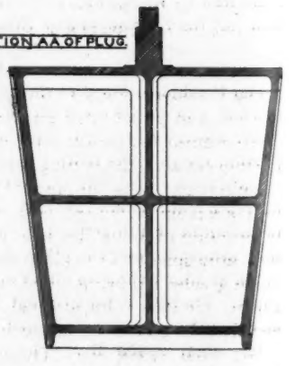
SECTION B-B.

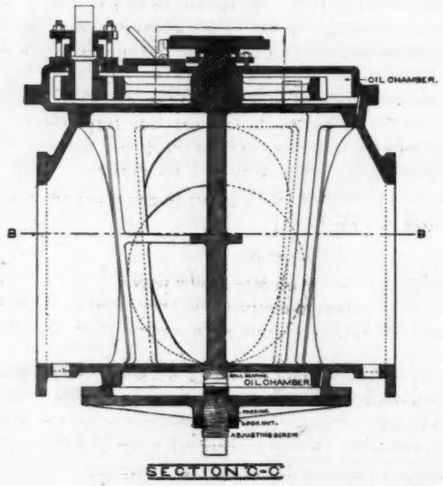


PLAN, HALF COVER OFF.

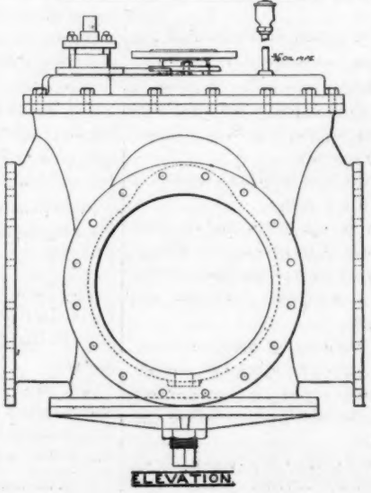


SECTION AA of PLUG.





SECTION C-C



ELEVATION

IMPROVED FOUR-WAY VALVE

FOR

24" × 30" × 7" DEEP

PURIFIER BOXES

AT THE

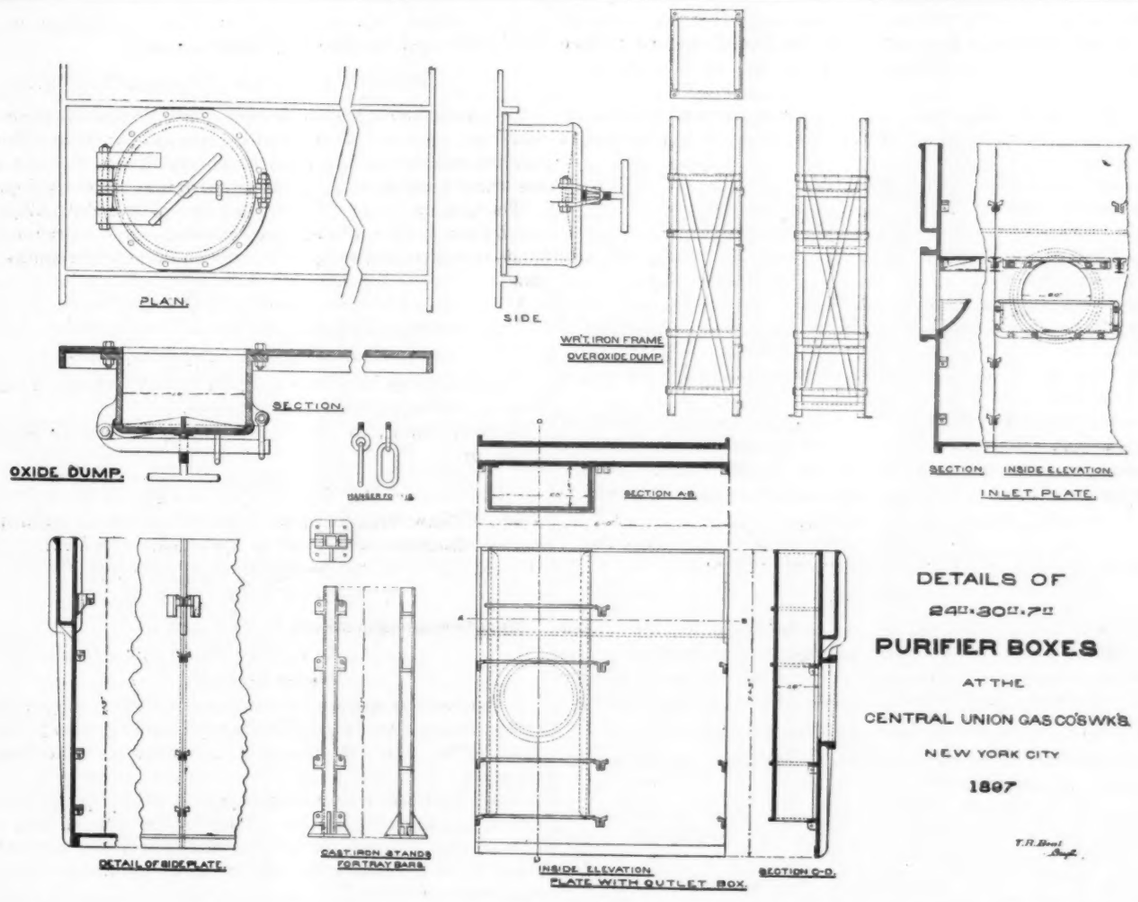
CENTRAL UNION GAS COS WORKS

NEW YORK CITY

1897

PAT. APPL'D. FOR.

T. A. Boal
Supt.



depth, and were we to put in others we should probably make them 10 or 12 feet deep. The thought is to get a slow flow of gas.

Mr. Thompson—Does Mr. Beal believe or mean there is an advantage in not working boxes consecutively?

Mr. Beal—I fail to understand why we should use four boxes in combination. We use but two.

Mr. Thompson—The point I wish to make is whether, in using a 3 or 4 box set, there would be any advantage in working them consecutively or in irregular sequence, so to speak?

Mr. Beal saw no particular advantage in using boxes consecutively. The space for the oxide material was 6 feet, the space between each layer being 1 foot.

On motion of Mr. Littlehales, a vote of thanks was passed to Mr. Beal.

Report of Committee on Place of Next Meeting.

Mr. Alten S. Miller, from the Committee on Place of Next Meeting, reported that the Committee had, after much discussion and consideration, decided to unanimously recommend Niagara Falls, N.Y., as the place for holding the meeting next year. On motion of Mr. A. C. Humphreys, the report of the Committee was accepted and adopted.

The President called for the

Report of the Committee on Research,

which was read by Mr. Alten S. Miller, as follows:

To the American Gas Light Association:

Gentlemen—The first subject taken up by your Committee was the adoption of a standard for house piping. The old standard that has been in use for many years by the companies distributing coal gas is as follows:

⅜-inch.....	20 feet.	3 burners.
½ "	30 "	6 "
¾ "	50 "	20 "
1 "	70 "	35 "
1¼ "	100 "	60 "
1½ "	150 "	100 "
2 "	200 "	200 "
2½ "	300 "	300 "
3 "	450 "	450 "

Allowing 6 feet of gas per hour to a burner, this table seems to be figured for gas of a gravity of .420, and a loss of pressure of 0.1 within 30 feet. The following will show the capacity of pipes of the length and diameter given in the foregoing for gas having a specific gravity of .420, .550 and .680, the loss of head in each case being .1 inch in 30 feet.

Table Showing Amount of Gas that will be Delivered in One Hour through Pipe of given Size and Length, with a Loss of Pressure of One Inch of Water in 300 *Feet.*

Specific gravity of gas.... ...		.420	.550	.680
Size of Pipe.	Length in Feet.	Cu. Ft. per Hour.	Cu. Ft. per Hour.	Cu Ft. per Hour.
⅜ inch	20	18	15.6	14
½ "	30	37	32.2	29
¾ "	50	101	88	80
1 "	70	210	180	162
1¼ "	100	360	310	280
1½ "	150	577	500	450
2 "	200	1,200	1,030	930
2½ "	300	2,050	1,800	1,610
3 "	450	3,300	2,850	2,560

After discussing this subject your Committee concluded to refer it to the Association for discussion before bringing in a final report. The question to be decided is, "What should be the maximum loss allowable in 100 feet of house piping?"

There seems to be no special reason for changing the diameters and lengths given in the old tables, so, when the loss of pressure has been agreed upon, it will be easy to determine a standard.

Your Committee has been in correspondence with the foundries which had agreed to adopt the standards for works and street main specials which were recommended by The Society of Gas Lighting. There seems to be some demand for specials made according to these standards, but they have not been taken up to any great extent. The specials made according to these standards seem to be satisfactory, but the subject is one that deserved more study than has been given it, and your Committee respectfully requests that it be allowed to wait until next meeting before making a final report.

Your Committee respectfully recommends the adoption of the United States Standard Gauge for sheet iron and steel plates, which gauge was made a United States Standard, by Congress in 1893.

In the line of research two papers have been secured for this meeting, viz.: "Report on Burner Stoppages," by Mr. Paul Doty, and "Some Further Experiments on Interior Illumination," by Mr. Alten S. Miller.

The following subjects are of interest to the members of the Association, and your Committee would like to have papers on one or more of them for the 1898 meeting:

"The Measurement of High Temperature."

"The Self-Enrichment of Coal Gas."

"The Production and Separation of Cyanides."

"The Effect of the Depth of Fire on the Practical Efficiency of Water Gas Generators."

"The Removal of Tar from Water Gas."

"The Effect of Regenerative Benches and Dips on the Production of Ammonia."

"The Loss of Illuminating Power of 25 to 30 Candle Gas when Mixed with Air."

The point has often been made that it is easier to write a paper than to find a subject. Many of the members of the Association should be in position to make investigations on the above subjects, and your Committee earnestly requests that such as can do so will volunteer.

ALTEN S. MILLER,
C. F. PRICHARD,
GEO. TREADWAY THOMPSON, } Committee.

Discussion.

On motion of Mr. Littlehales the recommendation that the United States standard gauge for steel plate and sheet iron be accepted by the Association was adopted. On motion of Mr. Neal the matter of pipe specials was referred back to the Committee for further consideration.

Then followed a lengthy discussion on the question—

"What should be the maximum loss of pressure allowable for 100 feet of house piping?"

the Committee inviting the discussion so that it could be determined through the general voice of the Association, the Committee to incorporate the figure agreed upon in its final report next year. Messrs. Somerville, Miller, Doty, Littlehales, W. Forstall, Searle, Secretary Forstall, Neal, C. J. R. Humphreys, Sherman, Cowdery and Thompson took part in the debate. A proposition to instruct the Committee to fix the figure at .1 inch loss of pressure in 100 feet of piping was voted down, and a motion to put the figure at .1 inch loss on each 50 feet of house piping was adopted. The President, on motion, declared that the report of the Committee was adopted, and that the Committee was ordered continued. On motion of Mr. Egner a hearty vote of thanks was passed to the Committee for the excellent work it had performed.

The President called for the

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS,

which Mr. E. C. Cowdery read as follows:

Gentlemen—Your Committee feels that unusual commendation is due to our President for the very thorough and exhaustive manner in which he has brought to our attention the various subjects presented for our consideration.

His words of appreciation for the work of the Committee on Education are so heartily endorsed by all of the members of this Association that this Committee wishes to emphasize them. We are sure that all of the members join with the President in extending words of gratitude to the members of that Committee.

Your Committee also wishes to call attention to the figures presented by the President on the output per capita. These figures are compiled in a way that makes them very useful to study, and many lessons may be learned on their careful perusal. Each of the subjects touched upon might well be given a special mention, so well has he brought out the useful points under each subject; but in this respect we feel it unnecessary for us to do more than congratulate the President upon his work, and many times congratulate the Association upon having placed a man in the President's chair who could and would bring to their attention so many useful and interesting thoughts. Respectfully submitted,

E. G. COWDERY,
J. H. JOURDAN,
C. F. PRICHARD, } Committee.

On motion of Mr. Doty the report was adopted and ordered spread on the minutes. On motion of the President the resolution adopted the first day, to cause the printing of the President's Address in pamphlet form, was repealed; the President urging the fact that the speedy appearance of the proceedings in print would cause the extra expense of printing the address quite unnecessary.

The President then introduced Mr. Henry A. Mather, of Brooklyn, N. Y., who read the following paper entitled

CHEMICAL NOTES ON PURIFICATION.

Before considering methods of chemical treatment of iron purifying materials, a review of the various formulas of the reaction between sulphureted hydrogen and hydrated oxide of iron, is pertinent to a better understanding of this especial department of gas making.

The familiar King's Treatise[1] uses the formula $Fe_2O_3.3H_2O$ to express the hydrated oxide of iron, and combining one molecule of this hydrate with three molecules of hydrogen sulphide produces the equation—

$$Fe_2O_3.3H_2O+3H_2S=2FeS+S+6H_2O.$$

Regeneration is expressed by—

$$2FeS+3H_2O+3O=Fe_2O_3.3H_2O+2S.$$

These equations have been accepted by many technical and chemical writers, evidently without investigation.

Edmond Borias, in his Treatise of Gas Manufacture[2], writes the equation—

$$Fe_2O_3.3H_2O+3H_2S=\begin{cases}Fe_2S_3+6H_2O, \text{ or,}\\ 2FeS+S+6H_2O.\end{cases}$$

Mr. William Mooney[3] differs from these eminent authorities, showing the absorption of sulphureted hydrogen, as follows:

$$Fe_2O_3+3H_2S=Fe_2S_3+S+3H_2O$$
$$Fe_2O_3+H_2S=Fe_2O_3+S+H_2O$$

He expresses regeneration by the equations

$$Fe_2S_3+3O=Fe_2O_3+S_3$$
$$Fe_2O_3+O=Fe_2O_3$$

It is difficult to account for this theory on any grounds, especially as he says that the "second equation in each case is probably the more correct." The water of hydration is omitted for [the sake of convenience.

Another technical writer contends that using Laming's mass the carbonic acid gas having greater affinity for the oxide of iron unites with it in the purifying box, the sulphureted hydrogen combining with the lime. In revivification the carbonic acid goes off into the air in the most accommodating fashion.

As all of these equations require the formula $Fe_2O_3.3H_2O$, they are of little practical value, for there is no such hydroxide in use for gas purification at present, for hydrated sesquioxide of iron loses part of its water of hydration unless it is kept under water. The hydroxide prepared from copperas when freshly precipitated is chemically expressed by $Fe_2O(OH)_4$ and bog iron ore is $Fe_2O(OH)_2$. The hydroxide prepared from borings is probably the same as bog ore.

Perhaps the most authoritative reaction is that given by Mr. W. J. A. Butterfield[4] in his Chemistry of Gas Manufacture, thus:

$$Fe_2O_3.H_2O+3H_2S=Fe_2S_3+4H_2O \text{ and secondarily,}$$
$$Fe_2O_3.H_2O+3H_2S=2FeS+S+4H_2O.$$

Quoting Mr. Lewis T. Wright,[5] he continues "that from 17 to 30 per cent. of the sulphureted hydrogen is taken up in accordance with the second eqation and the remainder in accordance with the first." Mr. Butterfield expresses revivification by:

$$2Fe_2S_3+3O_2=2Fe_2O_3+3S_2.$$
$$12FeS+9O_2=6Fe_2O_3+6S_2.$$

Sulphureted hydrogen or hydrogen sulphide undoubtedly combines in other forms with the hydroxide of iron, but these reactions are the major ones. Hydrogen sulphide is a feebly exothermic compound, but its combination with the hydroxide produces no rise in temperature, on account of the small percentage present and the large condensing surface of the third box as well as the contact with the separated water of hydration which undoubtedly absorbs much of the heat of the gas as well as the heat of combination.

A few years ago little attention was paid to the state of hydration of the iron, and sawdust was used as the only diluent because of the greater surface exposed to the gas. Sawdust possesses more disadvantages than advantages, however, because in a layer of more than 16 inches in depth it seldom does good work, the back pressure incident to the fouling of any oxide necessitating a change before it is wholly saturated. With a deeper box the space lost between the trays more than balances the advantages of extra surface. The diluent in most general use to-day is planer chips, for the chips combine decreased weight with greater

1. King's Treatise on Coal Gas, Vol. II., Part IV., Chap. III., pp. 17 and 18.
2. Traite de la Fabrication du Gaz, par Edmond Borias. Edition 1890, pp. 282 and 283.
3. American Gas Engineer and Superintendent's Handbook. Edition 1888, page 80.
4. Gas Manufacture. W. J. Atkinson Butterfield. Ed. 1896, pp. 90 and 96.
5. *Journal Chemical Society*, 1883, p. 156.

strength. The porosity of such an "oxide" remains scarcely impaired until the oxide is fouled and the purifying box may be filled to its capacity without trays.

The purifying value of a bed of oxide depends on the percentage of hydrated oxide present, the state of division of that hydroxide, and the ability of the bed to keep its porosity. The percentage of metallic iron originally mixed is scarcely a proper consideration unless the iron is wholly oxidized. It is not necessary that more than 60 per cent. of the iron should be hydrated, but any metallic iron present should be at least coated with oxide so that burner stoppage may be avoided.

A recent German writer claims that the rate of progression of foul gas through oxide should not be more than one-fifth of an inch per second. Mr. J. A. P. Crisfield[1] has reduced the calculation of the necessary purifying surface based on the make of gas per hour to a convenient formula for ready reckoning, so that gas companies contemplating extensions are not obliged to consult experts before placing their contracts.

I wish to direct the attention of those superintendents who are hampered by limited purifying surface to the paper written by your Secretary, Mr. A. E. Forstall,[2] for the last meeting of the Association. Until this paper was read, scarcely anyone had thought there was any field for investigation in the application of dry heat to purification. Many had attempted to admit steam with the gas, nearly always with poor success, and many have found it advisable and necessary to keep the purifying house warm in winter, but Mr. Forstall's plan of heating the gas only at the point of contact is, I think, the first effort of its kind. I understand that one of the New England works has been passing the gas at a higher temperature than usual from the condenser for some little time, but unfortunately I am unable to give any figures on the result of this method. The average temperature of the gas at the point of contact to day is 70° F. Mr. Forstall kept the temperature at 95°–100° F. at the outlet of the box. That it is expedient to supply heat to this reaction may easily be ascertained in the laboratory. Within certain limits the temperature, from a strictly chemical standpoint, may be increased to advantage beyond the usual practice of to-day. I doubt if it would ever be advisable to carry the temperature above 150° F., even if this increase would be practicable. It should be possible to figure as accurately and as quickly on the temperature necessary to insure purification at any rate per hour with a given surface, as Mr. Crisfield has figured on necessary surface. Naturally any change in the temperature at the purifiers would in most cases entail a change in the method of reading the meter at the works, unless condensation of some kind should follow the purifiers.

Unfortunately the conditions of most gas works are such that a catch layer of ashes, breeze, shavings or other porous material is necessary to protect the oxide from tar and like compounds. Tar will so quickly ruin a bed of oxide that it is cheaper to take it out than to use the oxide as a scrubber. The position of the catch layer beneath the oxide is hardly the best for good work because the separating water of hydration keeps it continually moist. Theoretically the condenser removes the last trace of tar or oil, but practically the catch layer is found thoroughly saturated after the third change. If the old boxes could be kept in position after new ones are built, or doubled into two instead of four, it would save money and time to use them as catch layers. Five per cent. of tar will injure oxide, and in many cases 8 per cent. will ruin it irretrievably. The removal of the catch layers from the purifying box would effect a considerable saving in room which would be available for oxide. This would mean fewer changes and a saving in labor.

Regeneration in the purifying box is constantly becoming the more general practice. With but few exceptions it has not been very successful. The discussion of its value has developed two parties, one of which favors the exhaust process, either steam or power, drawing air down through the inlet and out, and the other side proposes to blow air, either with or without steam, up through the box. There are undoubted advantages to be gained from some method that will enable a bed of oxide to be kept in its position until all or nearly all of its capacity of absorption has been used. The continued molecular movement in the purifying box both in purification and revivification has undoubtedly been responsible for some of the successes and some of the failures. Anyone who wishes to ascertain for himself the effect of this motion on a body of oxide may find it instructive to place a measured tube in position as a purifier, pass foul gas through until the mass is saturated, and then revivify by both methods. As far as laboratory experiment is a criterion the blowing up process is the better.

1. Proceedings of the American Gas Light Association, 1893, Vol. 10, § 2, p. 217.
2. Proceedings of the American Gas Light Association. 1896, Vol. 18, p. 201.

Regeneration in the purifiers is admittedly but a labor saving device, and even its warmest advocates admit that the bed must be changed after the third or fourth reviving. If there are to be twenty changes or more, then regeneration in the box even under stress of complete removal after the third change would be an economy. My argument in this case concerns itself with the necessity for so many changes of the box even under the worst conditions. The practice of admitting 1 or 2 per cent of air with the gas has been proved economical in so many cases that ample data may be had from a number of sources. Mr. Forstall's method of heat at the point of contact certainly saved him a number of changes, for his average purification between changes for a year before the adoption of this method was 10,000 cubic feet per bushel, using 1½ per cent. of air, and his average with heat was 30,000 cubic feet or more, thus saving him every third change at least. Using all the methods available for purifying more gas between changes it would seem that the necessity for regeneration in the box would almost disappear, except in a few cases where room is at a premium. In the samples of spent oxide from works using a regeneration *in situ* process, the particles are more agglomerated than usual, as if the heat had at some time quite or nearly reached the fusing point of sulphur. This in itself is a cause of the exhaustion of some beds of oxide, the particles of fused sulphur forming coatings on the outside of particles of oxide and preventing further contact with the gas.

A few of the English gas works use a method of floor revivification which is also in use here in this country to a limited extent. Old purifier trays, or new ones, of yellow pine, conveniently made at the works, are so supported from the floor or ground as to permit a circulation of air beneath the bed of oxide. This circulation stimulates regeneration in a manner similar to the action of a draught on fire. After exposing a 30 inch bed for a few days on this platform, it will be noted that the oxide has stratified into three layers. Regeneration is nearly complete at 12 inches from the bottom and 6 inches from the top, and a 12-inch layer in the middle is still foul, thus proving that regeneration from the bottom proceeds at double the speed of top regeneration. When the bed must be turned over, two-thirds of the foul oxide is thrown on the trays, then all the regenerated oxide, then the remainining third of foul oxide, or all the foul oxide is thrown on the trays with the regenerated on top. This method should be in more general use, for it saves half the time and labor of the present practice, and costs very little to introduce.

Discussion.

The President asked Mr. Miller to start the discussion on the Mather paper.

Mr. A. S. Miller said he had read the paper carefully, and that it covered the subject so well that not much had been left for debate. One thing referred to by Mr. Mather was that in many gas works the boxes were often serving the purpose of scrubbers. He did not know that it had yet been determined just what depth it was advantageous to pile the oxide in a box, or through how many lineal feet gas should be passed. In the discussion on Mr. Shelton's paper the point was urged that it was better to have two sets of two boxes, each in parallel, than to put it tandem through one set of four boxes; but it was fair to assume there should be a point where the two plans would meet. A certain maximum amount of gas might be equally well worked tandem or parallel. More gas might work better in parallel, while less gas might go better through boxes in tandem. That would have a bearing upon the matter of the amount of oxide necessary to pass the gas through. It was a question whether the boxes for purification in gas works could be advantageously constructed with a view to having them act as scrubbers as well. He did not see that there was any greater reason for blowing down than for blowing up when revivifying the oxide *in situ*, although the consensus of opinion at one of the meetings of the Western Association was that blowing down was the better way. Blowing up might tend to loosen the oxide, whereas blowing down might be reasonably thought to pack it. Mr. Miller did not much faxor the plan of revivifying oxide by piling it on grids.

Mr. Littlehales thought the Mather paper was a valuable one, especially in that it brought to mind again the facts presented by Mr. Forstall a year ago, which tended to show the advantage of purification at higher temperatures. He thought that the value of increasing the temperature in purification, as far as the increased work per bushel of material is concerned, was beyond question.

Dr. Birchmore, Messrs. Herman Poole, Thompson and Wheeler contributed much interesting matter to the discussion, the major portion of which was technical and beyond the reach of long hand reporting.

Mr. Mather, in replying to the comments on the paper, among other things said that the depth of oxide proper to employ was a puzzling mat-

ter to answer. It was largely dependent on the conditions of the purifying plant. If the purifying area were small and the make of gas was increasing, the right practice was to expose as great a quantity of oxide as possible, for the slower the speed of passing the gas, the more complete and satisfactory would be the reaction between the sulphureted hydrogen and the hydroxide. So far as blowing up or blowing down was concerned, either might answer; in fact, a combination of the two was not at all out of the question. He preferred, however, to blow up. He also adhered to the belief that tray revivification was preferable to piling the material on the floor.

The thanks of the Association were, on motion of Mr. A. C. Humphreys, voted to Mr. Mather.

The Association ordered a recess, to end at 2:30 P.M.

SECOND DAY—AFTERNOON SESSION.

President Nettleton called the Association to order pursuant to the motion for recess, and asked Mr. R. M. Searle, of Atlanta, Ga., to read his paper on

GAS ADVERTISING.

"We are advertised by our loving friends!" Has the gas company any loving friends? If not, why not? And if so, do they advertise you?

I am perfectly satisfied that a community, by careful and considerate treatment of their every want, can be classed as the company's loving friends.

We are in the business to make money. Advertising conscientiously and scientifically done, does and will pay as well as any investment a gas company can make.

The most valuable and important advertisement a gas company can have is a neat, commodious office, with a clean, attractive front, brightly illuminated at night, wherein stoves, appliances and devices of every known kind for the use of gas are exhibited. I do not mean by an attractive front a gem of plate glass plastered with theatrical or circus posters, nor a showroom in which there are several back-number stoves connected with small pieces of white rubber tubing so kinked that the stove will flash back half a dozen times when an attempt is made to light it, nearly frightening the customer to death, and creating an advertisement which in all probability causes a loss of many a dollar, nor in which the only illumination at night is a jet photometer back of the safe, while the office is a dungeon. We encourage a consumer to illuminate his store all night for the purpose of advertising, and if it holds good in his case it behooves us to have the brightest and best illuminated place in the city.

The word "advertising" is a broad one. Soliciting business, twisting a criticism, or by paint and tinsel, one can make a paying advertisement. One should be forever on the alert to convert every criticism into an advertisement; if against the company, by correcting it promptly, effacing its cause, and in all probability you will then have a loving friend, who will advertise you.

Have you ever noticed while spending the evening out a group of ladies scoring or praising the gas company, either because of some slight affront they were dissatisfied and were giving you an unprofitable "ad." gratuitously, or praising you because of some plain business courtesy they had received at the hands of one of the employees? When hearing such remarks has it ever occurred to you that you received a very valuable "ad." right then and there; did it carry a lesson? If against you, did you go home with the determination to do better and follow up the criticism by proving to your critic that the company was not at all bad, and ready and willing to meet them on more than even terms; and if the criticism was favorable did it spoil a good thing and cause you to cease trying to still further increase your advertisers?

The writer had the good fortune to have a crew of subordinates, each and every one a standing advertisement, each man treated as though he was a human being, educated to answer questions with intelligence, or refer them to some one of the company who could, and I found that each was doing his level best at every opportunity to advertise the gas company and increase its business. From the trencher to the highest man in the company's employ, each in his class was continually striving, if not to make a direct sale of an appliance, to at least advertise the merits of our product. Many hundreds of little ways would suggest themselves to each in his class, and if encouraged one would be very much surprised to see the novelty of the different advertisers among the employees.

Each consumer if properly handled will be an advertiser for you. Study your consumers and avail yourself of their good will. Do not kill the goose that laid the golden egg; treat them just as you would like to be treated and you will find that each consumer in turn will secure you another. I only wish that I could find words to express how really important this one little point is; there are others, but——

Mr. A., Editor of the "Laborers' Friend," comes into your office; he is in good faith, probably has an excellent advertising medium for reaching the people with whom you could do the most business if your "ads." read properly. You have an idea up your sleeve that newspaper "ads." are worse than useless; you give him one that reads like this: "A gas stove will toast ice cream better than by any other method. Eureka Gas Company." The next morning 5,000 of Mr. A's subscribers read this "ad.," or don't read it. I can just imagine the conversation of the average laborer's family as he runs across this "ad." What do I want with a gas stove that toasts ice cream? and the paper is laid aside. A little later Mr. A. comes in for another "ad.," you tell him you guess not, newspaper advertising doesn't pay, you know it doesn't; you have tried it and you cannot trace a sale to the "ad." that you gave him.

I think advertising could be safely classed amongst the sciences, and like all sciences with study one can soon master it. I am not referring to newspaper "ads." entirely, but to every scheme, device, deal, courtesy or action that can be twisted into an "ad.," or almost anything that can be made to do your company good.

Another example: Mrs. A. has just blown up her gas stove and inside of an hour the entire town has heard of it; then, of course, it reaches you in your den behind the holder; you say, "the game is up," no more stoves sold this month. This is an advertisement that perhaps has traveled throughout your entire territory within half an hour. Now for the reaction or boomerang; I suggest a double "ad." that will help you out wonderfully.

First, don't have a den behind the holder; be up on the main street where you can catch onto things as soon as your neighbor does.

Second, if politic, at once proceed to the printer's and order 5,000 dodgers that read something like this (first, of course, obtaining Mrs. A's consent, which you can probably do by making her a present of another gas stove): "Mrs. A, 210 B street, blew up her gas stove this morning, and she is now arranging dinner on another. If this had been an oil stove, what then? You all know the rest. Her husband would go without his dinner to-day." Now Mrs. A. started the agitation of the gas stove question that day, and some such method of availing yourself of her accident would prove that advertising did pay and your sales would go up instead of decreasing.

If an advertisement can injure from a dollar and cents standpoint, why cannot other advertisements, if properly worded and carried out, earn you money from the dollar and cents standpoint? It is a rule that works both ways.

The gas company can well afford to lay aside a fixed amount per 1,000 cubic feet, if no other unit is available for advertising purposes, and if a careful record is kept and a study carefully made the earnings can be arrived at.

We will assume a town of 25,000 inhabitants, with about 3,000 consumers on the line of mains. Make a canvass of each house in this town for the number of the three-eighths capped nipples that are sticking through the walls of the respective houses, and you will probably be astonished at the large number your canvass will show up. Now here is a word for one of the best paying investments; for instance, put an 'ad." in the paper that would read about like this: "The Gas Company will give away free of charge and place in position 1,000 one swing gilt brackets, burners, etc., complete, not more than five to any one house or factory." Now assume that only one-half or 500 of these brackets are used each night, and that each one in use is consuming 3 feet of gas per hour and is used but 1 hour per night, this equals 1,500 feet, or 547,500 feet per annum. Now take your profit figure and see what this would earn you. The cost will be about as follows: 1,000 brackets, if purchased in 1,000 lots, $200; freight, $5; labor, tools, etc., $120. The estimates I have given of consumption I consider very modest. If larger consumption exists why then the advertisement pays so much better. This costs as an advertisement about 32 cents per bracket, will last for years and might be termed a compound advertisement, as for every additional gas jet placed in a community just so in proportion will you be advertised. Of course if your company is wealthy you can go into such schemes as this on a larger scale, but I simply cite this example to prove that advertising must pay.

The writer was once stopped by a consumer who told him that he had just heard that the gas company had a splendid advertisement on a main street in a certain store. The writer went immediately around that way to see what advertisement existed that so impressed one of his customers and found two broken mantels and four badly seared mica chimneys on Welsbach lamps. If the consumer considered this an ad-

vertisement, and which it surely was, what could I think? The first thing was to talk it over with the storekeeper and see if it were possible to fix him up properly at the prevailing prices. He didn't feel that he could afford to do it, nor did I feel that the gas company could have a standing "ad." at such a serious cost to its welfare. We fixed him up free. To say that he was pleased does not half express it. By dropping a gentle suggestion to him he did not advertise the fact that we had done the work free, but pointed out his improved illumination to his neighbors with great pride and created, as I think, one of the Loving Friends I spoke of in the opening of the paper.

Have you ever concentrated three or four women together in a back yard or at a kitchen stoop to criticise or praise the handsome loaf of bread just turned out of a gas oven, in which you had baked it yourself, because the woman was skeptical as to the work a gas stove would do. Say there are four in the crowd, one has a stove, the other three make up their minds then and there that they must have gas stoves too. Inside of six months the four have stoves. Have you appreciated that this one loaf of bread, baked on the edge of a ditch perhaps, the dough being taken from the same batch from which the critical woman was about to bake another loaf in a coal stove, which loaf when finished did not compare at all favorably with the gas baked bread, would so advertise you when the four had stoves that if time were taken you would find that there was a geometrical progression in the increase of stoves due to this one advertisement. The connecting of a stove on the edge of a ditch, operating it and baking the aforesaid loaf may have cost $2 or $3, but I am satisfied that it pays.

Another great advertisement for gas is a gas engine, kept in nice order and in perfect running condition by the gas company. If the consumer neglects to do it you can, in consideration of which caring for the engine you can bring a consumer at any time and exhibit its work. The fact is, all gas engines should be kept in perfect order by the gas company, aside from repairs which can be done at a trivial cost. Say your community is a manufacturing one and you are visiting a club some night, half-a-dozen manufacturers are around discussing economies and management. Mr. A says: "I am going to put in a gas engine. I saw one over at Mr. B's, and I am so thoroughly satisfied with it that I have decided to put one in." Now, if Mr. B's gas engine had been in bad shape Mr. A never would have considered the subject. Here is an advertisement that starts you on the road to place three or four more engines or lose the sale of three or four. The writer considers this a serious matter because my competitor, the Superintendent of the electric company, made a very profitable "ad." out of a gas engine that had no care taken of it whatever and had lost the sale to me of some two or three before I got on to the base of his argument. One should not merely place an "ad." or assume that one "ad." was sufficient for all time, but should keep pounding away, small drives at a time and, in fact, I can never see an end to the advertising part of the business.

A few years ago, on every stone, fence, barn and newspaper we saw the sign of a famous healing oil; to day you scarcely find an advertisement of it. The druggists tell me it is rarely if ever called for, while they know that other oils that are equally advertised to-day are selling in equal quantity as compared with the sale of the original advertised article.

When installing appliances, put in only the best if you wish your product advertised. Only the best appliances should be considered. If you are going to try an appliance, and are doubtful as to its success, try it in your own house or works, as nothing attracts so much attention as something new, and you may be mortified to find how your failure, or its failure, has been advertised.

Those of you who have not tried the cooking school and its lectures, I recommend to do so; it is a very valuable aid towards the increase in sales of gas. Taken as a whole, it is the one educator for the future success of the gas business.

A manager is apt to think that with a couple of thousand stoves or so, Welsbachs, etc., that he has advertised in various ways awhile, that it is useless to go on. Let me dispel that idea, because you might advertise forever, and if you will take the trouble to go out and associate yourself with the public, you will find that there are people still who have never heard of a Welsbach or a gas stove. Here, of course, is an opportunity to use your wits, devising some way to secure business. Whatever you do, do well. Bear in mind that it seems to be human nature to kick at a defect in a job; be it in service trench or appliance, or treatment of your consumer, it will be advertised to your cost.

I once overheard a man scoring the gas company for referring him to a plumber when he wanted another jet put in at his shop. It occurred to me that that sort of advertisement we did not want; so when I returned to the office I started a record of just such applications, and when I looked over the records some months later was astonished to find that we had referred to plumbers a total of 158 small jobs, each requiring an additional burner, and upon investigation only three of the parties so referred had the work done. It then dawned on me that we had lost the gas consumption of 155 burners, whatever it may have amounted to; and it must have been considerable, because these people were looking for it rather than having it forced upon them. We then started to handle just such work as this. During 1896 we handled 1,167 house piping jobs of this description, and installed 3,903 fixtures equaling 4,850 burners, the result of following up criticism made by a dissatisfied consumer, for I feel that that was the origin of my intention to go into this sort of work. Now, assume that one-half of the 4,850 burners were used but one hour per day throughout the year they would consume, at 3 feet per hour each, 2,655,400 cubic feet. Now take your profit figures and see what this advertiser earned for us. I want to further add that from all the data I can get, we installed more fixtures during 1896 than all the plumbers previously installed in our territory during the preceding ten years, and I will further say that we so advertised gas that the increased demand for it in turn gave the plumbers more to do than ever before. Let me also suggest that you work in the word "gas" everywhere and upon every occasion possible. A good plan is to arrange with the newspapers to ask of all advertisers of rooms, houses, real estate, etc., to let, if they arranged for gas; here is a "tip" to the landlord, and most people tumble, and you can easily arrange it with the editor to insert and offer him, say 5 cents for each real estate "ad." where gas is specified as one of the inducements for renting.

When a large department store sells good goods at moderate prices and fair terms to the purchasers, then they are continuously advertised by their customers. Realizing this and working along these lines, I have had the satisfaction of seeing for the past five years its great value, and during that period our installation of appliances of all kinds for the number of consumers in our territory was phenomenal. The five years referred to shows an increase of 114 per cent. in meters and 217 per cent. in stoves, and the output of gas trebled.

I wish to make a contrast of two advertisements: First, a gas office where a lady is about to pay her bill through a "Hole in the wall," and the cashier grasps the money like a drowning man does a straw; without a word he receipts her bill and scales it back along with five silver dollars in change, and with a contemptnous air says "Next!" The lady says, "I would like to have my burners repaired so that I can turn them on." Cashier says, "Complaint clerk two windows down." It happens that the complaint clerk is at dinner; but the cashier doesn't care, and the lady walks out, while the gas company is out $4 or $5 per year, and how much more is hard to tell, lost by non-consumption from burners she is unable to use, probably corroded fast by still further mismanagement at the purifiers. This sort of "ad." is the most unfavorable kind the gas company can get. A "Don't-care-clerk" can make or break a gas company, and if a gas company has one and is broken it is solely the management's fault.

Second ad.: A lady steps up to a clear counter, behind which stands a pleasant clerk, who politely passes the courtesies of the day, and as lady lays her bill on the counter, takes it in, unfolds and receipts it or clips the coupon while she is getting her money from her pocket book, again folds it and places it in a neat white envelope with a clever advertising notice on its corner, gives her $5 change in clean, brand new bills (a supply of same being arranged for with the bank and kept for just such customers whom you know to be fastidious, and encouraging those who are not, to speak of the pleasure it is to do business with the gas company), and as the lady passes end of counter a clever clerk asks if it is in the company's power to improve the service at her residence. This is an easy method of avoiding and killing competition, and to those who have not availed themselves of it, let me commend it as a sure cure. This same treatment is equally applicable to mankind; although it may savor of loss of valuable time and can be quickly handled, and the time taken will be really made valuable and profitable. Each public-spirited act will increase your earnings, and that is what we are in the business for. A man that cannot feel that way ought to quit his job.

I have not written this paper to say how we should advertise, but to encourage the already enthusiastic gas man and prod the laggard to more profitable work.

In closing I will quote a little paragraph from *Life:* "There is a growing recognition of the fact that public spirit in a proprietor is a mighty good advertisement for a business."

Discussion.

Mr. E. G. Pratt, in opening the discussion, said, while he did not know that Mr. Searle had been through three wars, he was nevertheless certain that he was a thoroughgoing gas man. With Mr. Searle, Mr. Pratt was a firm believer in advertising, in the local newspapers particularly. He also believed in using the bills as advertising mediums, by printing thereon that which would be done by the company in the way of rectifying complaints, etc.

Mr. W. Forstall—Of late years several papers with nearly similar titles have been read before Gas Associations, but Mr. Searle, giving a very broad meaning to "Advertising," has covered all points of contact between company and consumers. There can be no question that such advertising always pays. We may ponder upon the relative merits of newspaper "ads.," compared with circulars delivered at front doors, of gas cooking on sidewalks as against cooking lectures at the company's office, upon the general idea of whether Mahomet can be brought to the mountain easier than the mountain to Mahomet; but when in only five years the meters increase 114 per cent. and the output is trebled, we recognize at once that if such result had been obtained by advertising, such advertising pays, and we are glad to hear how it was done. To me the paper is especially interesting, as our town of Lockport, N. Y., is of about the same size as Johnstown, and as the two are not far apart, the local conditions and the human equations are probably quite similar. If Mr. Searle has set separate meters for stoves he can tell us the increased output per lighting meter. This would be interesting as showing the effect of opening the capped up outlets by free distribution of brackets. Another question I would like to ask is, just what opposition, if any, was made to the company's invading what, in most small towns, has hitherto been considered the exclusive domain of the plumber and the gasfitter. In our attempts to advertise gas we have piped completely several houses, in each case gaining a consumer who would have been scared off by his plumber's bid on the work, but who willingly paid us what the job actually cost. We think that the final result of all our efforts to popularize gas will be to give the plumbers more, rather than less work; but they do not quite agree, and are not as friendly as we would like. For many reasons we prefer to do this house piping and numerous small fitting jobs, instead of (say) hiring one plumbing firm to do all our work at a specially low rate; but there seems to be much feeling among labor union men (mostly not available as new consumers, because poor or not along our mains), in the matter of our cutting out the plumbers in this way. I am desirous of finding out whether others are confronted with the apparent necessity of making enemies, while only trying to benefit their consumers as well as themselves in spreading the use of gas. Referring to the "den behind the holder," it is a very convenient place of refuge when special work is to be done, but there should always be a roomy office and show place on the main street. It is itself the very best advertisement. We are now paying $600 yearly in this way, and although believing that work should end with daylight we have found it advisable to keep open every Saturday evening during critical periods, such as early spring for ranges, and early fall for heaters. People are becoming accustomed to drop in, to see what of new there may be, and we are thus slowly educating them to think no longer of gas as an expensive source of light, but as an economy and convenience without which household cares would be greatly increased. Mr. Searle gives us two pictures, one of silver dollars with rudeness, the other of crisp treasury notes with urbanity. I know of a third, where, we will say with old-school courtesy, a notice printed on the bill and repeated on the sign that graced the den behind the holder, requested the consumer to "Be sure to bring the *exact* change." (Laughter.)

Mr. Thompson related an instance of how the manager of a large clothing store in a certain city advertised the gas company in a local newspaper. The "ad." took up a half page of the paper, and its text was: "Costs govern prices, and both are low. Here we have a daylight store illuminated by the Welsbach. Gas bill for last month, only $1.74." The gas company knew nothing about the "ad." until its manager saw it in the morning issue of the paper he usually read. He also heartily indorsed Mr. Searle's remarks about the character and practices of the company's office men, especially in respect of the caliber and methods of the manager. There could be no doubt about it that Mr. Searle was the right sort of man.

Mr. C. J. R. Humphreys was a firm believer in advertising. He did not believe any company, however small, could afford to maintain an office in an out-of-the-way place. The office, too, should be supplemented by a showroom in which the apparatus on exhibition should be properly displayed and practically connected. That Mr. Searle's remarks on how employees should treat consumers were sound required no confirmation. In fact, too much stress could not be put upon that matter. He rather favored the plan of having the company sell or otherwise put out gas stoves, etc., as against having such sales' disposal in the hands of local merchants. One minor scheme for advertising that seemed to bear good fruit in Lawrence this year, was to print an advertisement of the merits of gas stoves on the paper bags used by the grocers, fruiterers, etc. These bags found a resting place right in the kitchens of the households of Lawrence, and very often the days were warm when the bags and their contents were delivered in the kitchens.

Mr. A. S. Miller thought the Association should not indorse Mr. Searle's statement where he said: "I think advertising could be safely classed among the sciences, and like all sciences, with study, one can soon master it."

Mr. C. H. Page followed with a very interesting statement of his practice in connection with methods and plans for the better advertising of the merits of gas as a lighting, cooking, heating and power agent. He was particularly emphatic over the personality of the manager and his assistants, in respect of the good results that the right sort of personality secured. Oftentimes a good method failed, simply through the way it was carried out by its interpreters.

Mr. Pinkney then debated the practices followed in Utica, N.Y., in the matter of advertising, etc. In passing it might be said that his efforts in popularizing the use of gas for purposes other than lighting have been remarkably successful.

Mr. Wm. McDonald next recounted how, while traveling from Albany, N. Y., to New York city, he met a gentleman with whom he had some conversation. In their talk it developed that Mr. McDonald's companion was a resident of Johnstown, N.Y., and Mr. McDonald remarked that the only man whom he knew in Johnstown was a Mr. Searle. The reply was: "What, Searle; the manager of the gas company? He is a right good one!" This rather went to show that Mr. Searle's ways, in the instance of personality, were all right.

Mr. T. Littlehales spoke at length on the methods of advertising followed by the Syracuse (N.Y.) Company. Amongst other things he described how they had carried through the streets a handcart loaded with gas fixtures of comparatively inexpensive sorts, such as two, three and four light drops, kitchen fixtures, brackets, and so on. One or two canvassers or salesmen went along with the cart, calling the attention of the householders to the goods on show and for sale—and the result was a sale (the plan had been in use for nearly two months) of from $75 to $112 worth of goods per week. At Syracuse they were also running a cooking school quite like that mentioned by Mr. Searle.

Mr. A. C. Humphreys in speaking put particular emphasis upon the exceeding value to a gas company of a man whose personal manner was of the kind that made friends and retained them.

Mr. F. C. Sherman agreed with the paper's truths and with the statements of those who discussed it. He thought Mr. Searle had stated self-evident truths, and stated them well. He thought it required quite as much talent to sell gas as to make it.

Mr. G. B. Neal favored advertising in the newspapers. In fact, the Charlestown and Somerville (Mass.) papers were witnesses to his belief in such regard.

Mr. E. H. Jenkins thought the gas companies should see to it that prominence in a public way should be given to every accident that occurred through the use of a gasoline or vapor stove. Accidents of such nature were being constantly reported, particularly in the South and West.

Mr. Roper then gave some interesting figures regarding the falling off in the sale of gasoline stoves, as reported by or to the National Association of Stove Manufacturers. As between the business in that line for the years 1895 and 1896, the sales of gasoline stoves in the latter year showed a shrinkage of 84 per cent. as compared with the sales in 1895.

Mr. Searle then closed the discussion, replying seriatim to the queries and objections asked and offered by those who took part in the debate. His remarks were on quite as interesting lines as those of his paper. When Mr. Searle had finished, the Association (on motion of Mr. A. C. Humphreys) tendered him a hearty vote of thanks.

[To be Continued.]

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE proprietors of the Hackensack (N. J.) Gas and Electric Light Company propose to extend their electric service to the outlying village of Arcola.

THE authorities of Irvington, N. J., have granted a franchise for the operation of a gas works to the projectors of the Peoples Gas Company.

This franchise, as we understand it, is not to be considered in any sense antagonistic to the aims and ultimate purposes of the parties in control of the gas supply of Newark, N. J.

At a recent meeting of the Directors of the Freehold (N. J.) Gas Company it was decided to put the rate for an illuminating and fuel supply on an even basis—$2 per 1,000 cubic feet, with 10 per cent. off on accounts settled within 15 days.

A correspondent at Oswego, N. Y., forwards the following under date of November 5th: At a special meeting of the Board of Directors of the Oswego Gas Light Company, held on the 3d inst., to take suitable action concerning the death of the Hon. H. D. McCaffrey, for many years a member of the Board, the following preamble and resolutions were adopted:

"*Whereas*, Divine Providence has removed from our midst our honored friend and associate, Henry D. McCaffrey;

"*Resolved*, That we the members of this Board do testify to our appreciation of the worth and character of the deceased, whose opinions and judgment, formed from a wide experience in the management of both public and private affairs, were held in high esteem. His known ability, untiring energy, wise counsel and hearty co-operation, made him a valuable member of this Board. We shall miss his genial presence and cordial fellowship.

"*Resolved*, That we offer our heartfelt sympathy to the members of the family of the deceased, and direct that a copy of these resolutions be sent to them, and also be inscribed on the records of this Board."—James Dowdle, President.

At a meeting of the Marion (Ohio) Gas Light Company, the following Directors were chosen: C. C. Fisher, H. True, J. C. Leffler, H. Strelitz and J. B. Fisher.

Contracts have been awarded for the construction of a new holder (capacity, 60,000 cubic feet) for the Brantford (Ont.) Gas Company.

A correspondent at Nashville (Tenn.) forwards the following, under date of the 6th inst.: "Mr. Morgan W. Brown, First Vice-President of the Nashville (Tenn.) Gas Light Company, died at his home, 1618 West End avenue, Nashville, on the morning of October 31st. Deceased, who was born in Nashville, December 20th, 1853, was a son of the late Mr. W. L. Brown, and a grandson of Judge Morgan W. Brown. He received an academic education at Montgomery Bell, and afterward graduated in law at Vanderbilt University. After several years at the bar he resigned the active practice of law and devoted his attention to finance and investment, in which lines he was very successful. He frequently acted in a fiduciary capacity, and, as trustee and executor, was often confided with the administration of important estates. In every instance his discharge of such obligations was marked by strict conscientiousness and unswerving fidelity. He was also noted for his sociability, and the number of his friends was only limited to the circle of his acquaintance. His genial manners and unaffected cordiality made him an enjoyable and sought for companion. For many years he was a member of the Hermitage Club. In all the relations of life he was esteemed and respected, and his death will cause sincere and genuine regret in a large portion of the community. His wife and two children survive him. The funeral services were held at his late residence on the morning of the 2d inst."

Justice Titus has appointed Mr. John F. Moffet, of Watertown, N. Y., as temporary receiver for the Medina (N. Y.) Gas and Electric Light Company. The appointment was made on the application of the Holland Trust Company, which seeks to foreclose a mortgage bond issue, amounting to $75,000.

The Commission appointed to determine the value of the gas and electric plants owned by the LeRoy (N.Y.) Gas Light Company, has appraised the same at $27,850. The plants are hereafter to be operated on municipal account.

The Consolidated Gas and Electric Company, of Batavia, N.Y., has completed an addition to its main system the past season amounting to 4,456 feet. During the same time 2,800 feet of service pipe was put down, of which 1,500 feet was credited to services to new or additional consumers (71 in number) living on the lines of the streets through which the new mains were run.

A correspondent makes the following report of the annual meeting of the Sherbrooke (Quebec) Gas and Water Company: "The annual general meeting of the Sherbrooke Gas and Water Company was held in the board room of the Company, on the afternoon of November 3. The meeting should have been held October 13, but it was adjourned to the later date so that the arbitrator's award, which was due in the meantime, was prepared. More than half the shares of the Company were represented in person or by proxy. Mr. R. W. Heneker, President of the Company, presided, and Mr. E. F. Waterhouse, Secretary-Treasurer of the Company, was appointed Secretary. The report of the Directors showed a net profit for the year of $17,851.51, of which $12,000 has been absorbed by two semi-annual dividends of 3 per cent. each, and $5,000 added to the assets of the Company in the form of improvements. During the past 12 months the Company has increased its cash investment by something over $15,000, and the investment in the electric lighting property is now about $120,000. A short history of the negotiations with the City Council, leading up to arbitration for the sale of the water works by the Company to the city, was given, and the amount of the award, $115,167.69, was reported and the report was accepted by a unanimous vote, and a resolution was passed giving the Directors full power to make the necessary arrangements with their bondholders, in order to carry out the provisions of the arbitration board. The election of the Directors by ballot was proceeded with, Messrs. William Morris and C. D. White being scrutineers. This vote resulted in the unanimous election of the retiring Board, viz.: Messrs. R. W. Heneker, T. J. Tuck, J. A. Archambault, F. P. Buck and Walter Blue. A vote of thanks was tendered the Directors and the officials. At a meeting of the Board, held immediately at the close of the shareholders' meeting, the executive management chosen was: President, Mr. R. W. Heneker; Vice-President, Mr. T. J. Tuck; Secretary Treasurer, Mr. E. F. Waterhouse; Superintendent, Mr. Andrew Songster."

The proprietors of the Middletown (N. Y.) Gas Company have changed the meter rental system that formerly ruled. Heretofore all consumers were charged a meter rental of 12 cents per month; hereafter no meter rental will be charged whenever the monthly consumption of gas amounts in value to $1.

The National Electric Company, of Stamford, Conn., has been incorporated, with a capital of $100,000. According to the articles the Company proposes to build and operate electric light and gas works, water works and street railways. The shareholders, each of whom is said to hold an equal interest in the concern, are: Anthony N. Brady, of Albany, N. Y.; Walton Ferguson, of Stamford, Conn.; and A. M. Young, of Waterbury, Conn.

"Mr. J. J. Nutter, Superintendent of the Milford (Mass.) Gas Light Company, has decided to make his home permanently in Milford. When his neighbors in Mendon learned of his determination to take up a residence nearer to his field of labor, they tendered to himself and family a 'farewell party,' the expressions of goodwill spoken at which were of a nature to cause Mr. Nutley to wish that the gas plant was in Mendon rather than in Milford.—F. S."

A recent issue of *Engineering News* says that painting gasholders by compressed air was recently tried in New York by the Turner Machine Company, of this city, with complete success, and, it is further stated, with considerable economy over painting by hand. The painting was done on the gasholders of the Equitable Gas Light Company, which are located at 40th street and Avenue A, New York. The holders were lowered and the tops and three 2-foot sheets of the sides were painted, working from the ground. The holder was then gradually raised, as the painting the sides progressed. Owing to the necessity of using the holders in their ordinary storage capacity, the work was frequently interrupted; in fact, only during one day did the work progress steadily. On that day the top and 18 sheets were painted on a holder 90 feet by 90 feet, and 24 sheets high. The work was carried on from 9:50 A.M. to 5 P.M., and the area painted was between 16,000 and 17,000 square feet. Three men, using two sprays, did the work, at a cost for labor of $6.25, or less than ½ cent. per square yard. About the same amount of paint was used as would have been the case in painting by hand. A man with a brush can paint only from 1,200 to 1,500 square feet per day.

The J. & E. Stevens Company, of Cromwell, Conn., manufacturers of toys of all descriptions, have decided to rebuild their foundry building, which was recently destroyed by fire. The new structure will be constructed as near fireproof as possible. The framework of the buildings will be of steel, and the covering will be of corrugated iron.

(*Continued on page* 774.)

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

MONDAY, NOVEMBER 15, 1897.

(*Continued from page* 773.)

The Berlin Iron Bridge Company, of East Berlin, Conn., has been awarded the contract for furnishing and erecting the building, in accordance with designs prepared by the Bridge Company. The main foundry section is 40 feet wide and about 200 feet long. The trusses have a clear span. The sides of the building have been so designed that it is well lighted by large mullion windows. On the roof, at suitable intervals, are located ventilators arranged with shutters, so that they can be readily and easily opened or closed for ventilating purposes. The cupola platform, and floor as well, are built of steel framework and covered with steel plates. Besides the foundry building proper, the plans provide for two small buildings, with brick walls and steel roof, one of the buildings to be used as a boiler shop, the other to serve as a plating room. All of the buildings are to be lined with the Berlin Bridge Company's patent lining.

LAST week we noted the fact that certain residents of Minneapolis, Minn., had instituted suits for damages against the Minneapolis Gas Light Company, their claims being based on the allegation that certain discharges from the works' drips of the Company contaminated the wells from which water supplied for household use of the complainants was drawn. The cases were tried before Judge Johnson, who granted a motion to dismiss on the ground that plaintiffs had failed to establish facts sufficient to constitute a cause of action.

THE Philadelphia *Item* says: "Some time ago the police of the Twenty-fifth district of Philadelphia were mystified by the conduct of a number of downtown youths, who acted as though under the influence of liquor. The lads were closely watched with the hope, that it would be determined where and how they obtained the liquor which was believed to be the cause of their almost nightly maudlin condition. Watching did little towards explaining the mystery. The lads staggered about the streets at night, hooting and yelling and acting in general as beings of larger growth act when filled with bad rum. Finally three of the youths were arrested, and then the thing was explained through the confession of one of them. To Lieutenant Harner the talkative boy said: 'We ain't drunk. This is a gasoline jag we have on. It beats any other kind of a jag on record, and it doesn't cost a cent.' The boy was asked to explain more fully. He said it was the custom of the boys to climb up to the tanks on the gasoline lamps in the downtown alleys. They would turn on the fluid and then saturate a rag with it. Several boys would do this proceeding, and then all would gather in a quiet spot and inhale the fumes of the fluid until the effect produced was similar to that caused by liquor taken internally. The story was at first doubted by the police, but, after careful watching, the truth of the boy's statement was revealed."

THE proprietors of the New York, Rutherford and Suburban Gas Company, of Rutherford, N. J., have applied to the authorities for a franchise permitting them to supply gas in the borough of Hasbrouck Heights, N. J.

IT is not at all improbable that the properties of the Marysville (Cal.) Gas and Electric Light Company will shortly go into the possession of others than those who have controlled it for such a long time.

THE following pointer in connection with the gas supply of West Saginaw, Mich., comes to us by way of Detroit, under date of November 6th: "It has been now definitely settled that the Saginaw Gas Company, which supplies gas in West Saginaw, Mich., will petition the Common Council for a 30-year extension of the franchise under which the Company exists. The present franchise of the Company expires next spring, and by the provision of the ordinance governing the Company the Council must do one of two things: It must either extend the franchise for a period of 30 years, or it must purchase of the Company its works and pipe lines, together with the business. There is a provision whereby the Council, if it cannot fix upon a price which is satisfactory to the Company and the city, may subm it the matter to arbitration. It is generally known that the city is not over and above anxious to go into the gas business, though the Aldermen seem to think there is money in it. The difficulty is that the Common Council has no desire to increase the bonded debt of the city, and it would be impossible to raise money in any other way for the purchase of the plant. The city officials have been informed that the present Company would like to continue, and that an application will be made in the near future for an extension of the franchise. This will give the Aldermen the opportunity they have been looking for. There has been much talk in the Council about the price for gas being much higher than it should be, and the Aldermen have decided that they will fix the franchise so that the people will not pay as much as they are doing at the present time. The West Side Company is not so high in its charges as the East Side Company, and the Aldermen would like to force a reduction in the East Side rates as well; but as East Saginaw Company's does not run out for a number of years, the Board is powerless. The Aldermen and other officials have already commenced to correspond with other cities with a view to finding out the cost of gas, so that they will be prepared with data when the matter finally comes before them."

The Market for Gas Securities.

The market for city gas shares kept on its downward course during the week, Consolidated selling down to 188 to-day (Friday), with 189 bid at the close. The closing asked price was 190. Free offerings of long stock and the shaking out of slim margined holdings, together with the very weak tone of the share market in general, are offered as the reasons for this marked decline. We do not know any good cause for the slump, and our urgent advice is to hold the stock; for important practical developments in the local gas situation cannot be much longer delayed. Other city shares are dull, Standard common showing particularly ragged.

Brooklyn Union is steady. The dividend (semi annual of 3 per cent.) on these shares is payable December 1st. Peoples, of Chicago, is steady to strong. Bay State closed to-day at 6 to 6¼. Detroit gas advanced to 60, and a big block of the bonds was sold at auction at 95. Lacledes are weaker as to the common, and higher as to the preferred. Baltimore Consolidated is steady, with quite some trading in it of late.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

NOVEMBER 15.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	189	190
Central	500,000	50		..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	280	290
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	340	360
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	..	
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	79	81
Preferred	2,000,000	100	98	104
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	105	106½
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	130	136
Preferred	5,000,000	100	140	150
Bonds, 1st Mortgage, 5's	1,500,000	1,000	114	115
Yonkers	299,650	50	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	122	123
" " Bonds (5's)	15,000,000	1,000	110	..
Bay State	50,000,000	50	6	6¼
" Income Bonds	2,000,000	1,000	..	35
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	93	..
2d " " "	3,000,000	1,000	80	81
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Company	25,000,000	100	97¼	97¾
Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,069,000	.	91	94
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	70	77
" Bonds	600,000	1,000	100	..x
Cincinnati G. & C. Co.	8,500,000	100	201	202
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	58½	59½
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000		..	60
" Con. Bonds	4,312,000	..	85	90
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	81	85
" Bonds	2,000,000	..	93	95
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	118	125
" Bonds, 6's	2 650,000	..	107	109
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	86	88
Bonds	1,000,000	1,000	92	94
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	39	40
Preferred	2,500,000	100	90	92
Bonds	9,084,400	1,000	101	103

Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	94⅞	95
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10.000,000	100	94	94½
St. Paul Gas Light Co.	1,500,000	100	49	51
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	2,500.000	25	18	21¼
Bonds	1,000 000		98	100
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	84	86
Bonds, 5's	3,556,000	.	98	100
Wilmington, Del.	550,000	50	200	202

Advertisers' Index.

GAS ENGINEERS.

Page

Wm. Henry White, New York City ... 795
Fred. Bredel, Milwaukee, Wis. ... 780
Geo. R. Rowland, New York City ... 795
The Western Gas Construction Co., Fort Wayne, Ind. ... 786
Humphreys & Glasgow, New York City ... 782
American Gas Co., Phila., Pa. ... 780
David Leavitt Hough, New York City ... 797
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 795

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md. ... 793
United Gas Improvement Co., Phila., Pa. ... 785
Burdett Loomis, Hartford, Conn. ... 794
National Gas and Water Co., Chicago, Ills. ... 787
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 795
The Western Gas Construction Co., Fort Wayne, Ind. ... 786
Humphreys & Glasgow, New York City ... 782

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City ... 796
Continental Iron Works, Brooklyn, N. Y. ... 794
Deily & Fowler, Phila., Pa. ... 796
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 792
Stacey Mfg. Co., Cincinnati, Ohio ... 795
Bartlett, Hayward & Co., Baltimore, Md. ... 793
Davis and Farnum Mfg. Co., Waltham, Mass. ... 792
R. D. Wood & Co., Phila., Pa. ... 794
Isbell-Porter Company, New York City ... 794
Fred. Bredel, Milwaukee, Wis. ... 780
United Gas Improvement Co., Phila., Pa. ... 785
Berlin Iron Bridge Co., East Berlin, Conn. ... 782
National Gas and Water Co., Chicago, Ills. ... 787
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 795
The Western Gas Construction Co., Fort Wayne, Ind. ... 786
Humphreys & Glasgow, New York City ... 782
Gas Engineering Co., Pittsburgh, Pa. ... 792
American Gas Co., Phila., Pa. ... 780
Logan Iron Works, Brooklyn, N. Y. ... 796
Riter & Conley, Pittsburgh, Pa. ... 779

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City ... 795
R. D. Wood & Co., Phila., Pa. ... 794
James R. Floyd's Sons, New York City ... 796
Continental Iron Works, Brooklyn, N. Y. ... 794
Gas Engineering Co., Pittsburgh, Pa. ... 792
Logan Iron Works, Brooklyn, N. Y. ... 796
Riter & Conley, Pittsburgh, Pa. ... 779
Kirkham, Hulett & Chandler, London, Eng. ... 779

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md. ... 793
Fred. Bredel, Milwaukee, Wis. ... 780
J. H. Gautier & Co., Jersey City, N. J. ... 790
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. ... 790
Adam Weber New York City ... 790

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons, New York City ... 795
R. D. Wood & Co., Phila., Pa. ... 794

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich. ... 776
G. Shepard Page's Sons, New York City ... 795
Gas Engineering Co., Pittsburgh, Pa. ... 792

GAS METERS.

John J. Griffin & Co., Phila., Pa. ... 800
American Meter Co., New York and Philadelphia ... 799
Helme & McIlhenny, Phila., Pa. ... 799
D. McDonald & Co., Albany, N. Y. ... 797
Nathaniel Tufts, Boston, Mass. ... 798
Maryland Meter and Mfg. Co., Baltimore, Md. ... 798
Metric Metal Co., Erie, Pa. ... 798
Keystone Meter Co., Royersford, Pa. ... 798
Buhl Stamping Company, Detroit, Mich. ... 799

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia ... 799
John J. Griffin & Co., Phila., Pa. ... 800
D. McDonald & Co., Albany, N. Y. ... 797
Helme & McIlhenny, Phila., Pa. ... 799

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio ... 797
M. J. Drummond, New York City ... 797
R. D. Wood & Co., Phila., Pa. ... 794
Warren Foundry and Machine Co., New York City ... 797
Donaldson Iron Co., Emaus, Pa. ... 797

PIPE CUTTERS.

The Anderson Pipe Cutter Co., Marlboro, Mass. ... 779

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y. ... 787

GAS COALS.

Penn Gas Coal Co., Phila., Pa. ... 789
Perkins & Co., New York City ... 788
Despard Gas Coal Co., Baltimore, Md. ... 789
Westmoreland Coal Co., Phila., Pa. ... 789
Berwind-White Coal Mining Co., New York and Phila. ... 788
W. D. Althouse & Co., Phila., Pa. ... 789

CANNEL COALS.

Perkins & Co., New York City ... 788
W. D. Althouse & Co., Phila., Pa ... 789

GAS ENRICHERS.

Standard Oil Co., New York City ... 789
The Sun Oil Co. Pittsburgh, Pa. ... 789

COKE.

Pittsburgh Gas and Coke Co., Pittsburgh, Pa ... 777

COKE CRUSHER.

C. M. Keller, Columbus, Ind. ... 789

CONVEYING MACHINERY.

C. W. Hunt Company, N. Y. City ... 776

GAS GAUGES.

The Bristol Co., Waterbury, Conn ... 778

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 787
Isbell-Porter Co., New York City ... 794
The Wilder Mfg. Co., Phila., Pa. ... 778
R. D. Wood & Co., Phila., Pa. ... 794
Wm. M. Crane & Co., New York City ... 778

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City ... 794
Continental Iron Works, Brooklyn, N. Y. ... 794
G. Shepard Page's Sons, New York City ... 795
Logan Iron Works, Brooklyn, N. Y. ... 795
R. D. Wood & Co., Phila., Pa. ... 794

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N. Y. ... 790

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J. ... 790
B. Kreischer & Sons, New York City ... 790
Adam Weber, New York City ... 790
Laclede Firebrick Mfg. Co., St. Louis, Mo. ... 790
Cyrus Borgner, Phila., Pa. ... 790
James Gardner, Jr., Pittsburgh, Pa. ... 790
Henry Maurer & Son, New York City ... 790
Baltimore Retort and Firebrick Co., Baltimore, Md. ... 790
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. ... 790
Brooklyn Firebrick Works, Brooklyn, N. Y. ... 790
F. Behrend, New York City ... 779

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa. ... 784

THORIUM.

The Roessler & Hasslacher Chemical Co., N. Y. City. ... 776
Dr. Philipp Hirsch, Berlin, Germany ... 776

INCANDESCENT LIGHT PREPARATIONS.

Dr. Philipp Hirsch, Berlin, Germany ... 776

MICA GOODS.

The Mica Mfg. Co., New York City ... 776

BURNERS.

C. A. Gefrorer, Phila., Pa. ... 794
Theo. Clough, Dobbs Ferry, N. Y. ... 776
Wm. M. Crane & Co., New York City ... 778

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn. ... 778

STREET LAMPS.

Welsbach Street Lighting Co., New York and Phila. ... 777

GAS BAGS.

Peerless Rubber Mfg. Co., New York City ... 776

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 787
Greenpoint Chemical Works, Brooklyn, N. Y. ... 776
Henry W. Douglas, Ann Arbor, Mich ... 787
Gas Purification and Chemical Co., Ltd., London ... 787

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind. ... 781
Isbell-Porter Company, New York City ... 794
Connelly Iron Sponge and Governor Co., New York City 787

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y. ... 786
Chapman Valve Manufacturing Co., Boston, Mass. ... 786
R. D. Wood & Co., Phila., Pa. ... 794
Continental Iron Works, Brooklyn, N. Y. ... 794
The P. H. & F. M. Roots Co., Connersville, Ind. ... 781
Isbell-Porter Co., New York City ... 794
The Western Gas Construction Co., Fort Wayne, Ind. ... 786

ELECTRICAL APPARATUS.

Wm. Henry White, New York City ... 795

GAS ENGINES.

Otto Gas Engine Works, Phila., Pa. ... 760
The American Gas Engine Co., Phila., Pa. ... 791
Backus Water Motor Co., Newark, N. J. ... 786

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City ... 777
W. G. & G. Greenfield, East Newark, N. J. ... 746

PURIFIER SCREENS.

John Cabot, New York City ... 778

GAS STOVES.

American Meter Co., New York and Philadelphia ... 783
Maryland Meter and Manufacturing Co., Baltimore, Md. 798
Keystone Meter Co., Royersford, Pa. ... 798
Wm. M. Crane & Co., New York City ... 778

INSTANTANEOUS WATER HEATERS.

Gilbert & Barker Mfg. Co., New York City ... 777

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y ... 786

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md. ... 793
Continental Iron Works, Brooklyn, N. Y. ... 794
Deily & Fowler, Philadelphia, Pa. ... 796
Davis & Farnum Mfg. Co., Waltham, Mass. ... 792
Kerr Murray Mfg. Co., Fort Wayne, Ind. ... 792
Stacey Mfg. Co., Cincinnati, Ohio. ... 795
R. D. Wood & Co., Philadelphia, Pa. ... 794
Logan Iron Works, Brooklyn, N. Y. ... 796
Riter & Conley, Pittsburgh, Pa. ... 779

GAS SECURITIES.

Marquand & Parmly, New York City ... 776

BOOKS, ETC.

Scientific Books ... 788
Field's Analysis ... 790
Digest of Gas Cases ... 789
Directory of Gas Companies ... 797
Practical Photometry ... 790
Coal Tar Genealogical Tree ... 778
Management of Small Gas Works ... 782
Handbook on Gas Engines ... 793
Gas Flow Computers ... 779
Hughes' "Gas Works" ... 787

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Must all be in first-class repair. Address

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FOR SALE,

One 8-Inch Kerr Murray Center Seal.

In good condition. For sale because too small for works.

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Position Wanted

As Superintendent of Gas Works.

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Two Coolers, or Air Condensers, each of 150 000 cubic feet capacity.

Multitubular Condenser, shell, 36 in. diameter, with 98 2-in. tube, 10 ft. 6 in. long.

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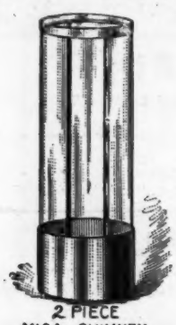

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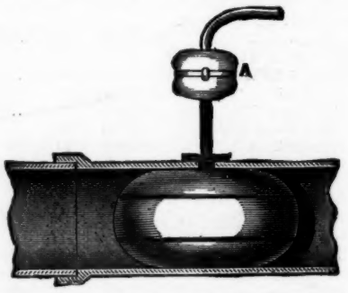
Peerless Patent Improved Gas Bag



These Gas Bags are used to stop the flow of gas while repairing or making alterations in gas mains. There have been numerous cases of workmen being badly injured, and sometimes fatally, by the escape of gas resulting from the bursting of a bag, and our patent improvement is designed to obviate such calamities. The indicator A shows unerringly when the bag has been sufficiently inflated to pack the main, and when the pumping should be stopped. Our Bags are made of a rubber stock especially prepared to admit of great distension, and to resist the action of Oils, Gases, Naphtha and other residuum in the mains, and they are made with lapped joints, which adds greatly to their strength.

3-in. Gas Bag, each,	$0.60	12-in. Gas Bag, each,	$5.00
4 " " "	.80	16 " " "	8.25
5 " " "	1.05	20 " " "	12.00
6 " " "	1.75	24 " " "	17.00
8 " " "	2.65	30 " " "	27.50
10 " " "	3.75		

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16 Warren St., N. Y. City.

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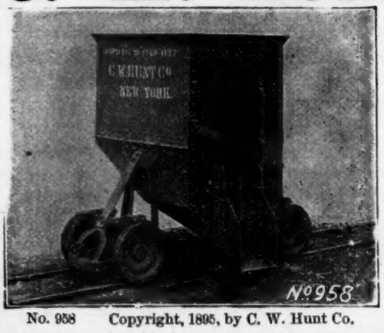

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GREAT SAVING OF FUEL AND FLOOR SPACE.
A HIGH-CLASS BOILER WITH AN UNEQUALED RECORD.
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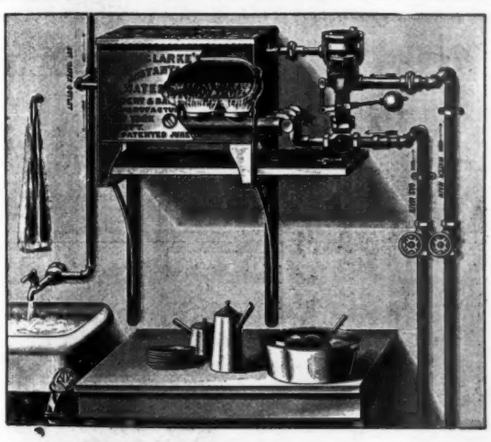

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This Heater furnishes water heated as it flows. The act of drawing water from any faucet with which it is connected automatically turns on the gas, which is in the same way instantly shut off when the flow of water is stopped at the faucet. It will deliver a gallon of water a minute as long as required, at a temperature 80° higher than it is delivered to the Heater; or it will deliver a less amount at a higher temperature, or a greater amount at a lower temperature, as may be determined by regulating the flow at a faucet. We have testimonial letters from those using it in Private Residences, Factories, Barber Shops, Restaurants, Stables, Laboratories, Stores, Churches, Commercial Buildings (for scrubbing), Banks, Clubs (baths, shower baths and sprays), Hotels, Riding Academies (baths and shower baths), and Patrol Stations

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Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

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Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

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ITHACA, N. Y.	BROOKLINE, "	NEW HAVEN, Conn.
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CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.

BRAY'S BURNERS

Are Suitable for All Pressures and Conditions, and for Efficiency, Economy and Durability are Unrivaled.

Producing a steady, well-shaped flame with burner cock turned on full. Prevent waste of gas, broken globes and dissatisfied consumers.

As Sole Agents in the United States for GEORGE BRAY & Co., we carry a full stock of all sizes for High and Low Pressures. Send for Prices and Special Pamphlet, or order a sample gross, stating your average house pressure.

Every Burner is stamped with name and trade mark. Cheap and inferior imitations are constantly coming in and going out of use, and we respectfully warn the trade against this kind of deception, as it causes loss and discredit to the trade and damage to the gas industry.

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Gas Logs, Fires, Heaters,

OF ALL KINDS.

GAS GOVERNORS,
GAS FURNACES,
and everything pertaining to the use of Gas.

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GAS RANGES,

Broilers, Griddles, Ovens, Etc.

Gas Kilns for China.

Special Line of Gas Appliances for Hotels.

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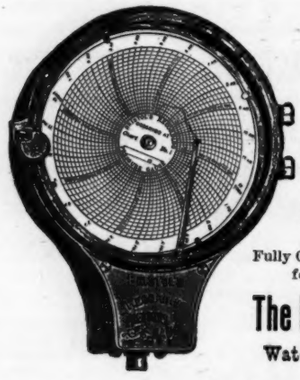

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WILDER'S VOLUMETRIC GOVERNORS.

They control the pressure at the burner, and deliver the quantity for which they are set regardless of high or low pressure in the supply.

WELSBACH LIGHTS are fully controlled, and the governors soon pay for themselves by preventing the breaking of mantles and chimneys. Thousands are already in use. Orders may be given to the Welsbach Co., or sent to ourselves.

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Order Recently Received—16 Machines, each for 3,500,000 Cubic Feet per day.

The Patentees of the above, after several years' experience, finding that the enormous weight of the iron sheets (forming the washing discs) caused undue wear of the shafts and consequent fractures of the latter, introduced their Patent Wooden "Grid Segments." These "segments" have now been fitted in some hundreds of Patent "Standard" Washer-Scrubbers, and are universally admitted to be a great improvement upon the out of date pattern.

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GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers. Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

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THE ANDERSON Patent Cutter Carrying Link
Made in all sizes.

Will cut from 2 in. to 24 in.
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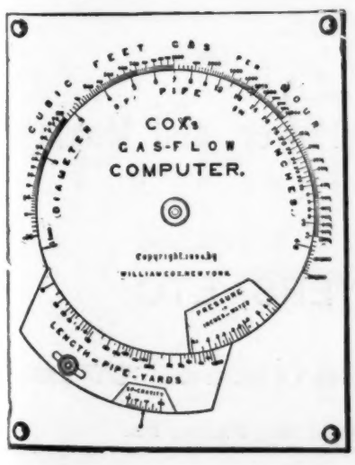

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1. It gives at a glance the discharge of gas from pipes 1 to 48 inches in diameter and 10 to 10,000 yds. long, for any pressure from 0.01 to 10.0 inches of water, and any specific gravity from 0.40 to 1.00.
2. When the required discharge and the length of pipe are given, the diameter corresponding to any pressure is at once seen.
3. When the required discharge and the length of pipe are given, the pressure corresponding to any diameter is at once found.
4. Any suitable combination of the different factors of any problem, under all possible conditions, may be immediately found.

It Prevents Errors and Saves Hours of Tiresome Calculations.

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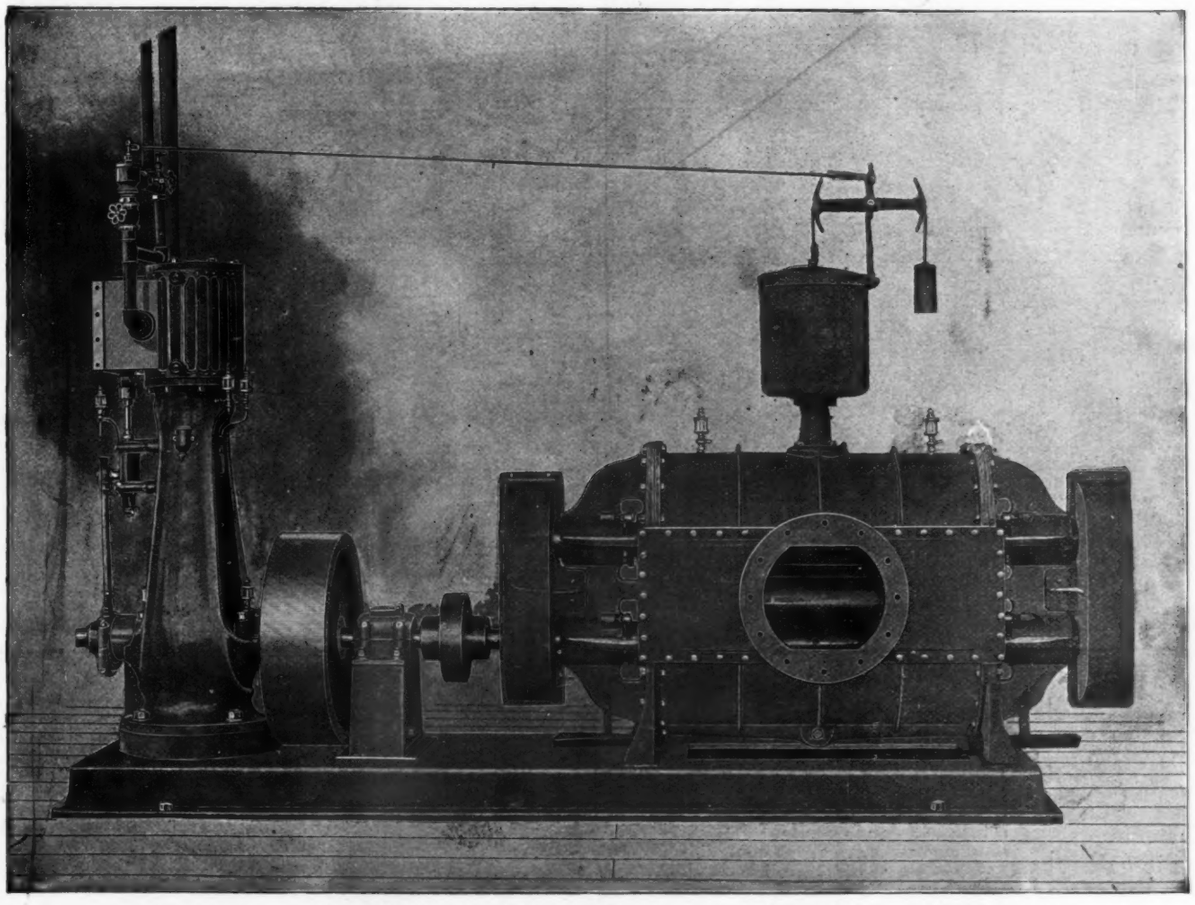

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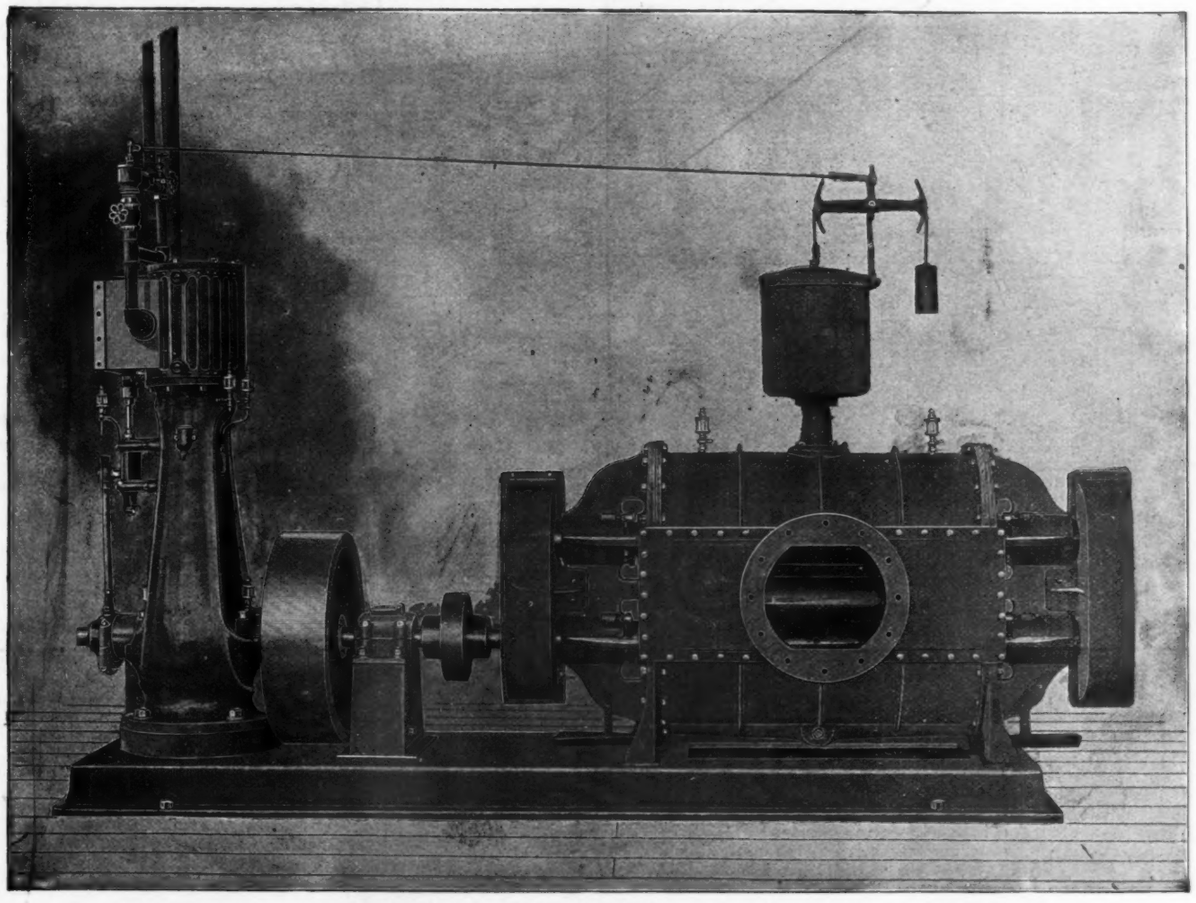

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The above illustration is taken direct from a photograph, and shows the Machine Room of the New Bedford Gas Co., at New Bedford, Mass. The Roof of this building was furnished by us. The building is 32 feet wide by 150 feet long, the Roof being made entirely of iron—that is, iron trusses and iron purlins covered with corrugated iron. The room is ventilated by a wrought iron ventilator extending the full length of the building, with corrugated Iron shutters on each side opening and closing by cords from the floor.

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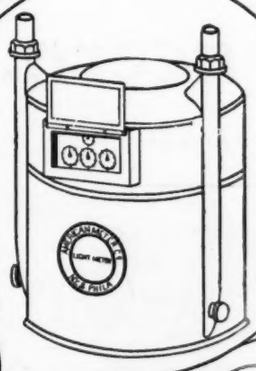

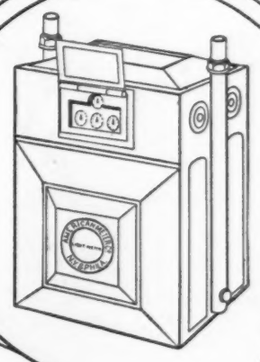

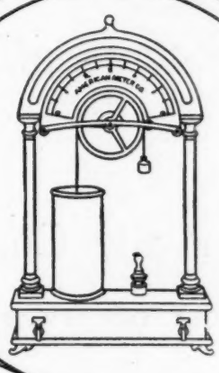

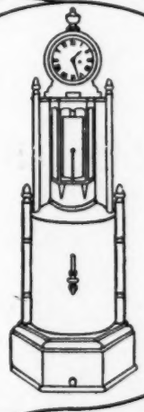

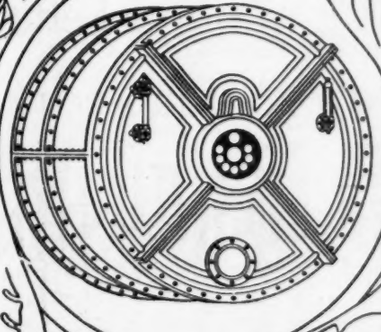

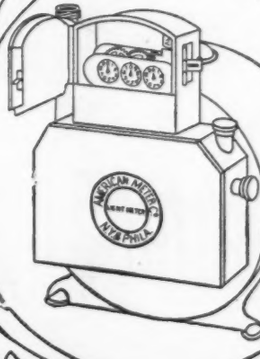

PUBLIC LIGHTING TABLE.

NOVEMBER, 1897.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M
Mon.	1	10.40 PM FQ	5.30 AM	4.45	5.35
Tue.	2	11.50	5.30	4.45	5.35
Wed.	3	12.50 AM	5.30	4.45	5.35
Thu.	4	1.50	5.30	4.45	5.35
Fri.	5	3.00	5 30	4.40	5.45
Sat.	6	4.00	5.30	4.40	5.45
Sun.	7	No L.	No L.	4.40	5.45
Mon.	8	No L. FM	No L.	4.40	5.45
Tue.	9	No L.	No L.	4.40	5.45
Wed.	10	5.20 PM	6.20 PM	4.40	5.45
Thu.	11	5.20	7.00	4.40	5.45
Fri.	12	5.20	7.50	4.30	6.00
Sat.	13	5.20	8 50	4.30	6.00
Sun.	14	5.10	9.50	4.30	6.00
Mon.	15	5.10	10.50	4.30	6.00
Tue.	16	5.10	12.00 AM	4.30	6.00
Wed.	17	5.10 LQ	1.00	4.30	6.00
Thu.	18	5.10	2.10	4.30	6.00
Fri.	19	5.10	3.20	4.25	6.00
Sat.	20	5.10	5.50	4.25	6.00
Sun.	21	5.10	6.00	4.25	6.00
Mon.	22	5.10	6.00	4.25	6.00
Tue.	23	5.10 NM	6.00	4.25	6.00
Wed.	24	5.10	6.00	4.25	6.00
Thu.	25	5.10	6.00	4.25	6.00
Fri.	26	5.10	6.00	4 20	6.10
Sat.	27	5.10	6.00	4.20	6.10
Sun.	28	8.30	6.00	4.20	6.10
Mon.	29	9.40	6.00	4.20	6.10
Tue.	30	10 40 FQ	6.00	4.20	6.10

TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	233.00	January	423.20
February	187.20	February	355.25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.35
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45

To Whom It May Concern.

WE have learned that the makers of the "Sunlight" lamp assert that there has been a decision in the English Courts which saves them and their customers from liability as infringers of the Welsbach patents.

We assure the public there is no decision of any Court, in England or elsewhere, that directly or indirectly warrants the statement or inference that the lamp sold by the Sunlight Incandescent Gas Lamp Company of America is not an infringement of the Welsbach Light as made under the American patents, of which the Welsbach Light Company is sole and exclusive owner.

NOTICE is hereby given to all PURCHASERS and USERS of the so-called "Sunlight" lamp that suits will be brought against them for DAMAGES for INFRINGEMENT of the Letters Patent of the Welsbach Light Company, and will be prosecuted vigorously.

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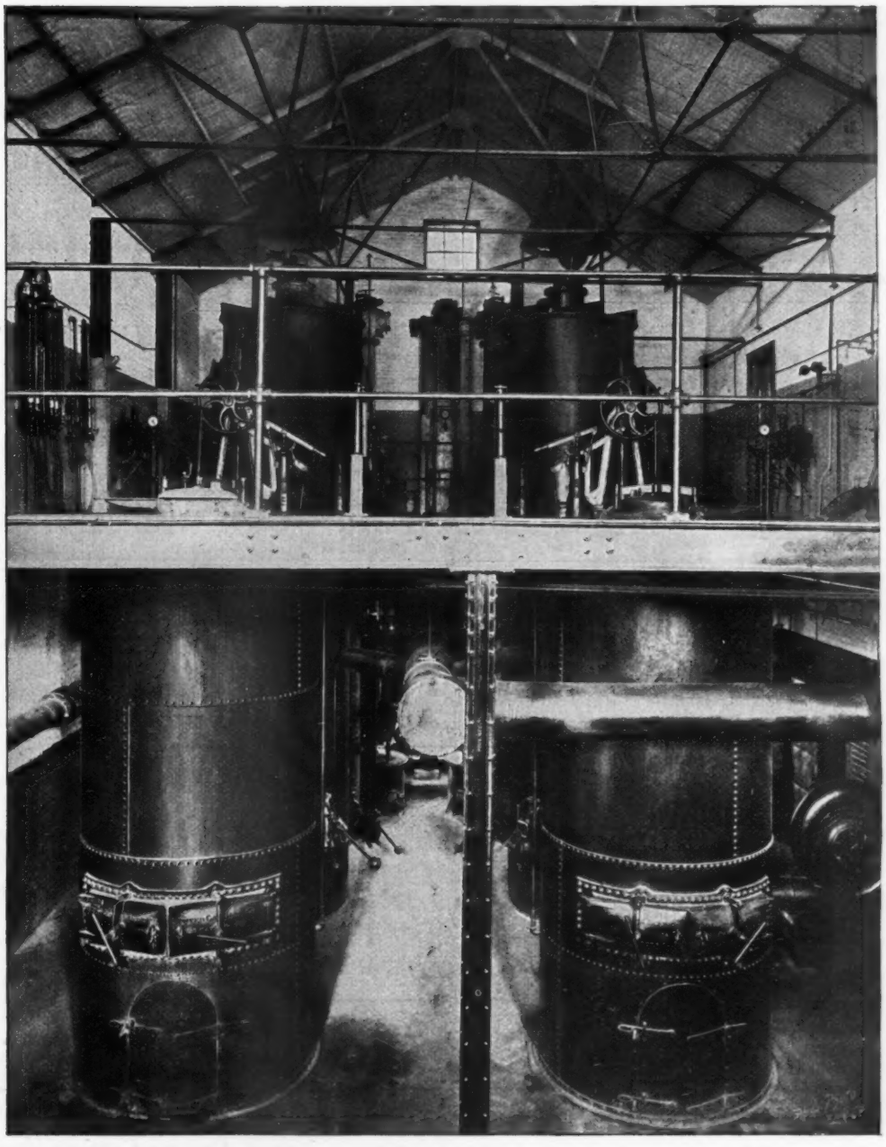
Number of Installations to Date, - - 237

Total Daily Capacity, 127,300,000 Cu. Ft.



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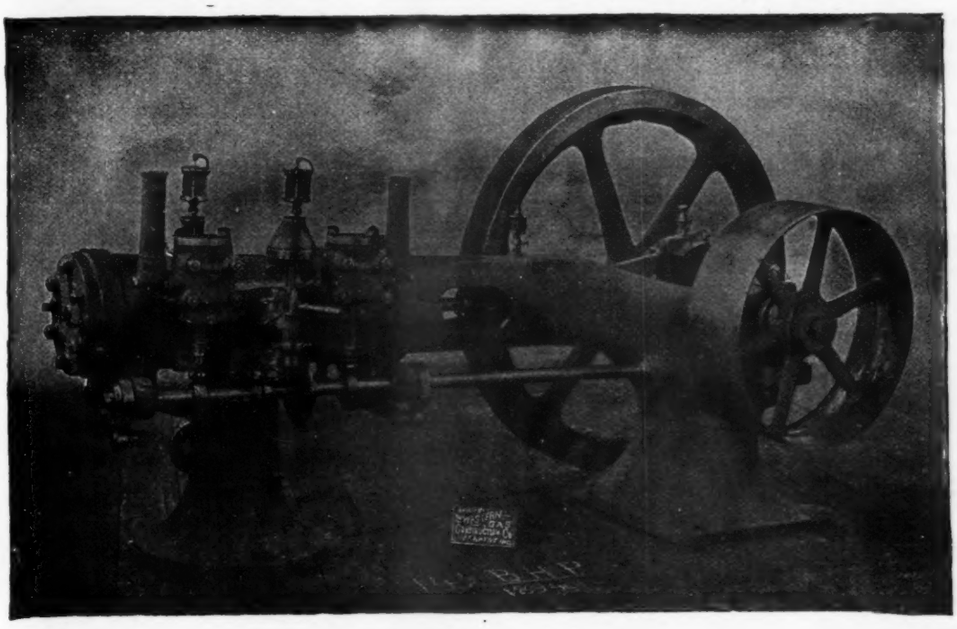

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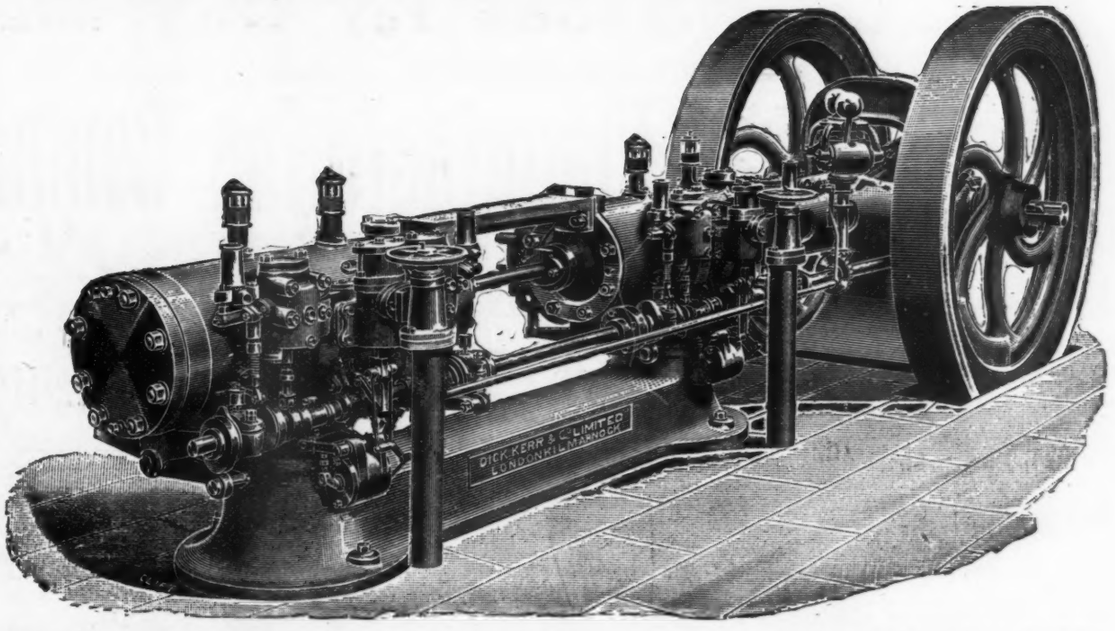

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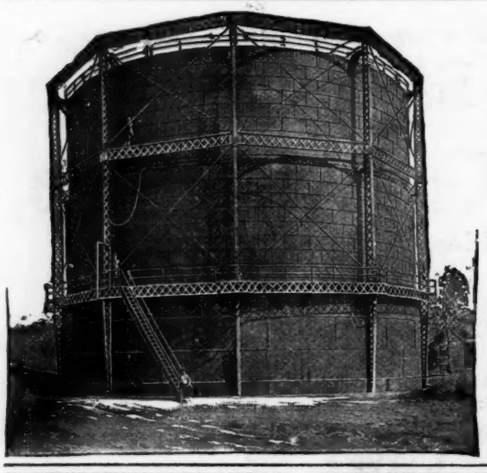

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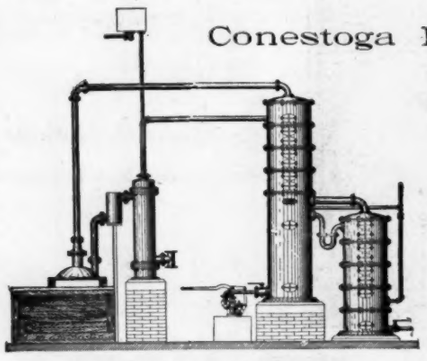

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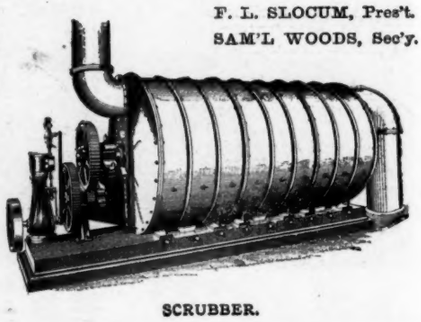

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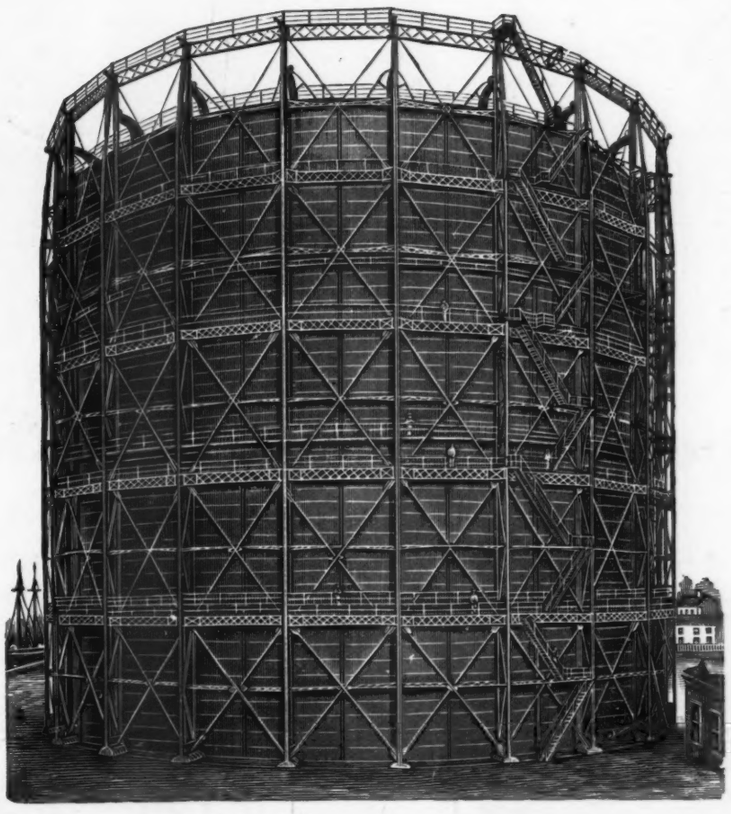

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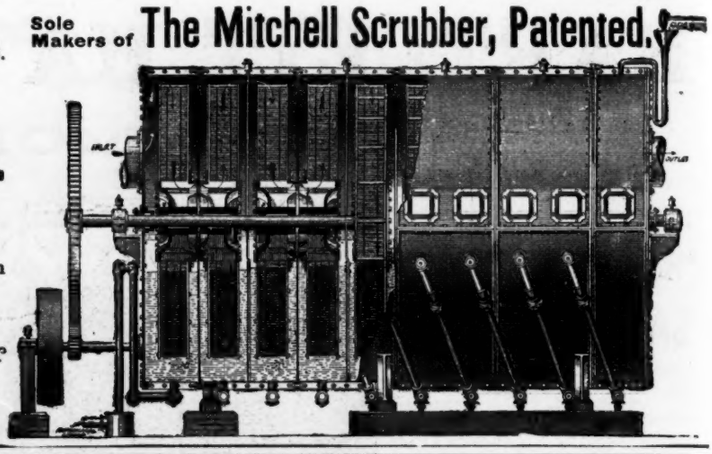

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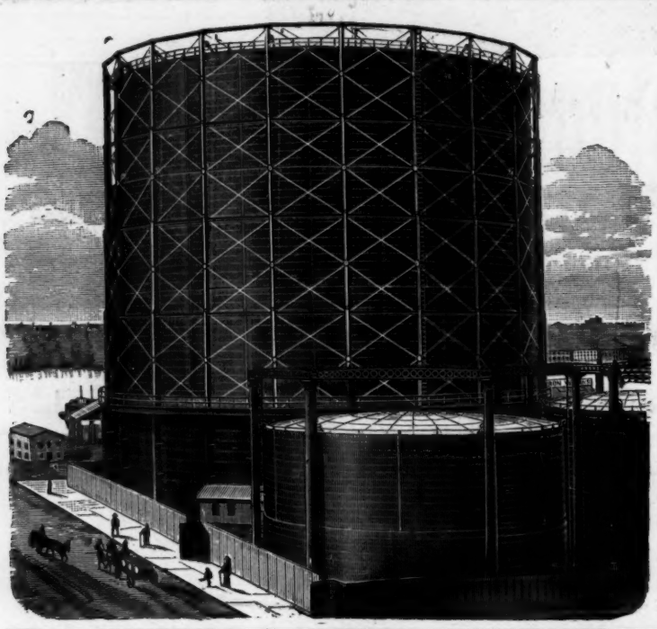

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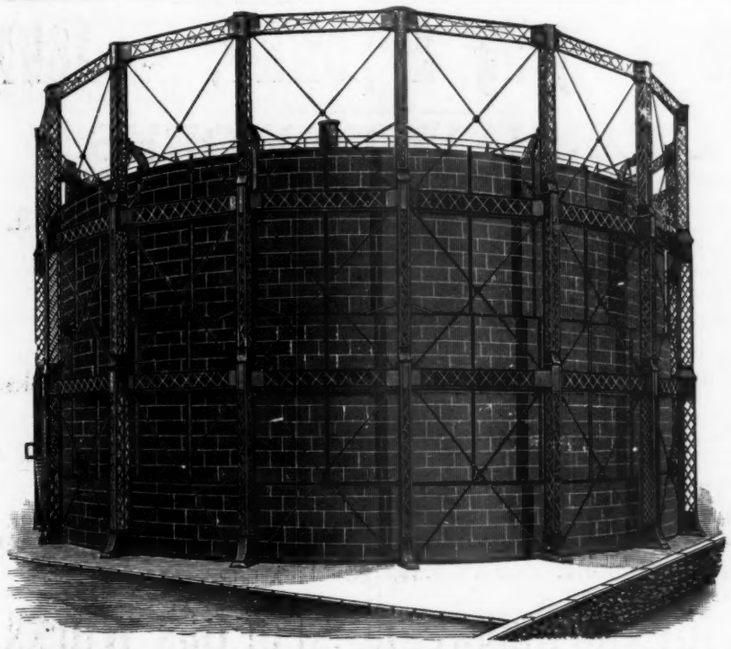

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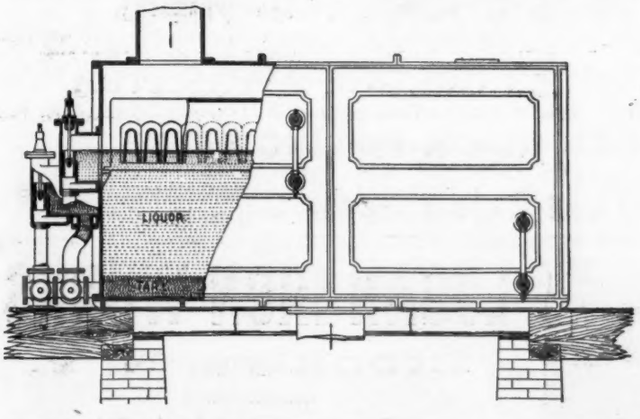

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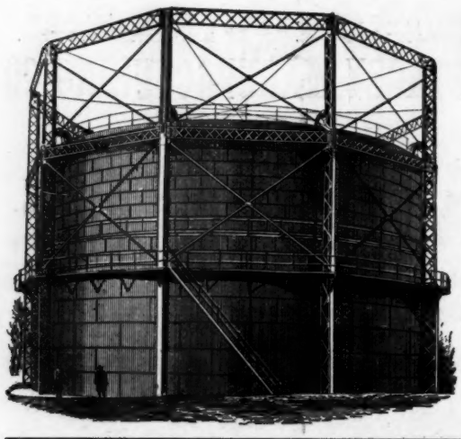

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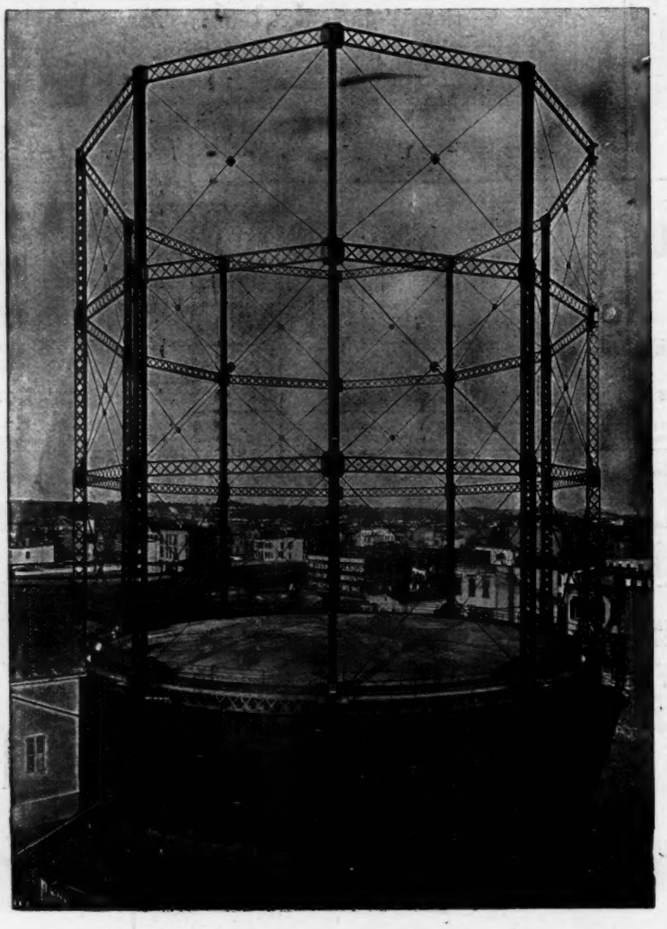

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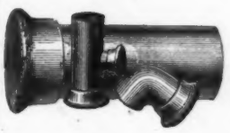

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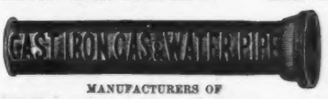

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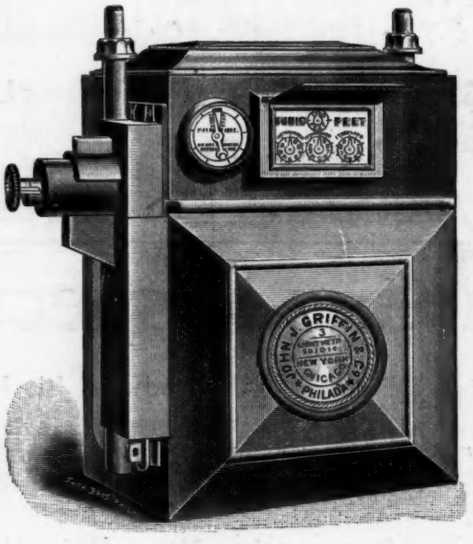

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